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# APPENDIX A
# ISSUE, CONCERN, AND OPPORTUNITY IDENTIFICATION PROCESS

## I. IDENTIFICATION OF ISSUES AND CONCERNS

### A. Purpose of Issues and Concerns

The National Forest Management Act of 1976 (NFMA) was enacted to resolve issues concerning the benefits that people want in the form of goods, services, uses, and environmental conditions. The planning philosophy was to focus around the capabilities of the Forest to resolve the major issues and concerns directly related to the development and use of the National Forest. Therefore, identification of issues and concerns was a key step in the planning process. The issues and concerns identified early in the process changed as planning developed and new issues were added. The degree of concern about some issues also changed during the process. For example, the firewood program gained public concern, while concerns about common mineral materials decreased.

### B. Process Steps

A list of public issues and management concerns was developed in the following sequence of events. Additional information is available in planning process records at the Supervisor's Office Headquarters.

The scoping process, which has its basis in NEPA, was actually done twice. Once for a DEIS published in 1982, and again for this DEIS. The second scoping process resulted in the final list of issues which were addressed in the planning process.

#### 1. Screening Criteria

Screening criteria were developed to indicate whether the issue or concern was resolvable within the scope of the Forest Plan. They are shown below:

| Criteria | Description |
|---|---|
| Scope: | The geographic Forest area involved. The larger the Forest area involved the more likely a proposal will be to appear on the final list. Scarce resources such as old growth, although perhaps not large in area, are also candidates. |
| Duration: | Over what timespan will the issue/concern continue? Issues of long duration may carry more weight than those of short duration. |
| Intensity: | How much of the public is involved and aware of the proposed issue? The larger the affected public, the more likely a proposal will become an issue. |
| Future Options: | What, if any, future options are threatened if no change in current Forest Service management or program occurs? |

These criteria were agreed upon by the Interdisciplinary Team on October 17, 1978, and presented to the Forest Management Team in November 1978. The public was introduced to the screening criteria in the "Forest Plan Report" which was mailed on November 28, 1978.

2. Preliminary List of Public Issues and Management Concerns and Opportunities Developed

Preliminary issues and concerns were identified from two sources. One was in-service from the Forest Management Team, comprised of the Forest Supervisor and his Staff, and the Ranger Districts. The other was from the public. Brainstorming sessions were held within staff groups and the Ranger Districts to identify preliminary management concerns. These concerns were then presented at a Forest Management Team meeting where they were reviewed and approved. Correspondence from the public received during Land Management Planning which resulted in the 1978 Land Management Plan, the RARE II process, Environmental Analysis Reports, and through the normal course of business was analyzed and used to compose a list of preliminary issues. The issues were then combined by resource area so they could be addressed more effectively when tested against the screening criteria.

3. Draft Writeups

An ad hoc team comprised of a member from each of the Ranger Districts and two members from the Planning Team was formed. This team tested the preliminary issues and concerns against the screening criteria and prepared draft writeups.

4. Review of Draft Issues

Draft issues were presented to the ad hoc team and the Interdisciplinary Team for review. The issues were then presented to the Forest Management Team for approval at their November 20, 1978 meeting.

5. Preliminary Issues and Concern Review

Preliminary issues and concerns, approved by the Forest Management Team, were mailed to the public in the "Forest Plan Report" on November 28, 1978. The public was given until December 31, 1978, to respond and was given a response guide to aid them. The "Forest Plan Reports" of November 22, 1978 and November 28, 1978, also announced seven workshops to review the list and to suggest any changes or additions that should be made.

6. Public Workshops

In December 1978 the Forest conducted a series of seven workshops in LaPine, Crescent, Sisters, Bend, Eugene, Portland, and Redmond. A total of 109 people attended the workshops. The April 9, 1979, "Forest Plan Report" summarizes attendance by interest groups.

7. Content Analysis

All public comments, both those received at workshops and in writing, were analyzed and used to evaluate and revise the list of 28 issues. No new issues were identified. Individual comments were coded so they could be traced back to the original input and were categorized by:

a. Type of response (workshop, response form, personal letter, etc.)

b. Origin of the response.

c. Interest group.

d. Issues receiving the most public interest.

As a result of public comments, 11 of the 28 issues initially prepared by the Forest Management Team were revised.

8. Management Approval

The revised list of issues and concerns was presented to the Forest Management Team after review by the Interdisciplinary Team on January 16, 1979. The Forest Management Team approved the issues on January 19, 1979. The final list of issues was approved by the Regional Forester in February of 1979.

On April 9, 1979, the final list of issues was sent to the public in the third issue of the Deschutes National Forest "Forest Plan Report."

9. Additional Concerns

Thirty-nine people responded to the April 9 "Forest Plan Report". Additional concerns were also identified after reviewing the Regional issues and the RPA policy issues.

This input was analyzed and combined with the previous analysis. The Interdisciplinary Team recommended that eight of the existing issues be changed and that two issues be added. The Forest Management Team reviewed, revised, and approved the issues at its meeting on December 10, 1979.

10. New Issues Added

A February 15, 1980, issue of the "Forest Plan Report" was sent to advise the public (1) that 8 issues had been modified and that (2) two entirely new issues have been added to the list, for a total of 30 issues.

11. Draft EIS Forest Plan Released

On October 17, 1982, copies of the Draft EIS, Proposed Forest Plan, and Summary were released to the public. During the public comment period, over 350 people attended informal meetings held in Eugene, Portland, Crescent, LaPine, Bend, Redmond, Sisters, and Madras.

Analysis of written comments received showed that 10 to 12 issues received the bulk of the comments.

## II. CONSULTATION WITH OTHERS

### A. Introduction

A three-pronged approach to initiate and maintain close coordination with other Government agencies, Indian tribes, local citizens and groups was used throughout the planning process. Numerous internal meetings were held with other National Forests; the Regional Office; and, at the Deschutes National Forest level, with the Ranger Districts and Supervisor's Office Management Staff. These were held to insure the production of a Forest Plan that is easy to understand, monitor, and implement.

### B. Forest Plan Reports

During the process of formulating the issues and concerns list, names of those wishing to be kept informed and involved were gathered and incorporated into a mailing list. "Forest Plan Reports" were mailed during the various critical planning process steps and after the DEIS and Forest Plan were issued to report the results of public comment on those documents. Many times their input was requested and used to aid in better decision-making.

### C. Public Outreach Program

This program was designed to obtain public input during the formulation of the alternatives on a "one on one" basis in the summer of 1979. Local business owners, representatives of timber industry, special interest groups, and landowners were interviewed by Deschutes National Forest staff members.

Many of these people were involved from that date on through special informational meetings with Chamber of Commerce members, The Group (members representing local businesses), and timber industry and through periodic "Forest Plan Reports" and telephone communications. These are documented in planning process records.

### D. Other Governmental Agencies and Indian Tribes

To insure involvement and coordination with other Governmental agencies and the Confederated Tribes of Warm Springs Indian Reservation, Interdisciplinary Team members composed a list of activities and areas of concern to be coordinated. Meetings were scheduled to accomplish these tasks. Interdisciplinary Team members maintained contact with most of the agencies throughout the planning process. The nature of the planning step determined whether agencies wanted to be involved to a great extent. In many cases, information was given and requested through the "Forest Plan Report" medium. The list of agencies and topics follows.

Comments on the Draft EIS and Forest Plan issued in October 1982 indicated that we should have maintained better coordination with the Oregon State Department of Forestry. That was accomplished for Draft EIS.

# COORDINATION OF PUBLIC PLANNING EFFORTS

| | Topics |
|---|---|
| Gallagher<br>Bend Parks and Recreation<br>Deschutes County Planning Dept. Recreation Committee<br>Oregon State Parks Dept. | 1. Overview of planning process.<br>2. Coordinate activities. |
| Mullen<br>U.S. Fish and Wildlife Service Endangered Species Branch | 1. Population objectives for Threatened and Endangered Species.<br>2. Management of critical habitat for Threatened and Endangered species, timber management, recreation management, transportation management, etc.<br>3. Planning process and regulations.<br>Subjects Discussed<br>1. Planning process and regulations.<br>2. Their population objectives for deer and elk.<br>3. Fish management.<br>4. Habitat management and coordination.<br>5. Data they have on fish and wildlife resources.<br>6. Transportation planning.<br>7. Relationship between wildlife resource and recreation.<br>8. Habitat improvement opportunities. |
| Oregon Fish and Wildlife | 1. County roads impacted by resource activity.<br>2. Forest highways impacted by resource activities. |
| Kellogg - Boddie<br>Bureau of Land Management<br>U.S. Soil Conservation Service | 1. Monitoring<br>2. Inventory<br>3. Capability and Suitability<br>4. Analysis of the Management Situation<br>1. Overall planning process.<br>2. Coordinated use plans for grazing allotments.<br>1. Establish what impacts all resource management activities will have on the road system. Include other road users as well as Forest Service - Eng. (BLM) |
| Calish<br>Deschutes County Economic Development Commission - Jesse Butler<br>Department of Environmental Quality<br>Jim Curtis - Economic Development Specialist | |

| McCammon | Topics |
|---|---|
| Department of Environmental Quality<br>Environmental Protection Agency | 1. Water quality monitoring.<br>2. 208 Planning - Water quality standards.<br>3. Pesticide Use. |
| State Marine Board | 1. Boating regulations.<br>2. Deschutes River update. |
| Oregon Department of Water Resources (Watermaster)<br>U.S. Bureau of Reclamation | 1. Reservoir management.<br>2. Responsibilities. |
| U.S. Corps. of Engineers | 1. Power potential.<br>2. River basin studies. |
| Juhl | |
| West Central District<br>Oregon State Dept. Forestry<br>Walker Range Forest Protection Assn.<br>Prineville District - BLM<br>B.I.A. | 1. Suppression action (fire).<br>2. Fire Management Policy. |
| Brooks Scanlon<br>Gilchrist | |
| Planning Staff | |
| Willamette National Forest<br>Umpqua National Forest<br>Winema National Forest<br>Fremont National Forest<br>Ochoco National Forest | 1. Planning process.<br>2. Coordinate activities along boundaries. |
| Confederated Tribes of Warm Springs<br><br>Bureau of Indian Affairs (Ken Englebrtson) | 1. Planning process.<br>2. Activity coordination.<br>3. Establish what impacts all resource management activities will have on road system. Include other road users as well as Forest Service. |
| County Commissioners<br>Deschutes<br>Jefferson<br>Klamath<br>Lake | 1. Planning process.<br>2. County roads that will be effected by resource activity.<br>3. State highways that will be effected by resource activities.<br>4. Forest highways effected by activities.<br>5. Co-op roads managed with other agencies or private company.<br>6. Establish what impacts all resource management activities in our area will have on the road system. Include other road users as well as Forest Service.<br>7. Potential or new wood products industry (species, sizes, different products).<br>8. The direction toward a change in appearance of the forest property.<br>9. Any major change in direction logs move.<br>10. County Weed Control District. |

| Parker (Engineering) | Topics |
|---|---|
| County Road Departments<br>Deschutes<br>Klamath (1, 2, & 3)<br>Lake<br>Jefferson | 1. County roads that will be effected by Forest Service resource activities.<br>2. Forest highways that will be effected by resource activities.<br>3. Roads that are under cooperative management with Government agency or private company that will be effected by resource activities.<br>4. Establish what effects all resource management activities in our area will have on the road system. This should include other road users as well as U.S. Forest Service.<br>5. State highways that will be affected by resource activities.<br>6. Pesticide use. |
| Oregon State Highway Dept. (5 & 3) 6 | |
| Federal Highway Administration (5) | |
| Brooks Scanlon<br>Gilchrist Timber Co. (4 & 5)<br>Sunriver, Inc. | |
| Camp Sherman Road Committee (3) | |
| Hill | |
| State Forestry<br>Bureau of Land Management | 1. Wood policy.<br>2. Christmas tree policies.<br>3. Other miscellaneous products - cones, seedlings, etc.<br>4. Diversity and visual objectives along common boundaries.<br>5. Insect and disease advice and assistance to public coordinated effort and lines of responsibility. |
| Occupational Health and Safety Administration | 1. Snags, pit development, logging methods. |
| Planning Staff | |
| City Commissioners | 1. Allowable harvest.<br>2. Stumpage values whch eventually become part (30-90 percent) of 25 percent funds.<br>3. Projected use of salvage sale fund which impacts receipts. |
| Central Oregon Intergovernmental Council | 1. Planning process.<br>2. Coordinate activities. |
| County Planning Directors<br>Deschutes<br>Jefferson<br>Klamath<br>Lake | 1. Planning process.<br>2. Coordinate activities. |

## III. SELECTED ISSUES AND CONCERNS

Many of the original issues identified through the process previously described did not receive any public comment during review of the Draft EIS published in November of 1982. As a result of that, criteria were developed to screen the original list of issues and concerns that would be treated in the Alternatives. The criteria that were used are listed below.

1. The issue must have a high public interest.
2. The issue could foreclose future options.
3. Large parcels of land could be affected by the issue.
4. The issue is expected to attract long term public interest.

Some of the issues dealing with Special Uses (electronic sites, cinder pits, etc.), facilities, coordination with private landowners, and the role of fire management when screened through the criteria were dropped and will not be addressed in the Alternatives. There is not high public interest, future options are not being foreclosed, small parcels of land are involved, and at present there is no long-term public interest. The same holds true for recreation residences. Reasons for considering eliminating them in some Alternatives and not in others did not surface. Only limited areas of land are involved and public interest was limited to the owners of recreation residences.

Public comments also indicated the need to approach treatment of a few issues in a different way. This was particularly true with the firewood issue. Many people expressed the concern that a more definitive program which ensured a continuing supply of personal use firewood was needed. A new approach was developed and is discussed in the description of each Alternative.

The following table shows how the issues are addressed in the Alternatives. Eighteen issues are addressed either by land allocations, scheduling activities, or by Standards and Guidelines. The issues received their final review in October and were approved by the Forest Supervisor on October _____, 1984.

## HOW THE ISSUES WERE ADDRESSED IN THE ALTERNATIVES

| | Deferred for Resolution Outside Planning Process | Treated Same Through-Out All Alternatives | Treated Differently in Design of Alternatives | | |
|---|---|---|---|---|---|
| | | | Allocations | S&G's | Scheduling |
| -- How should the Forest consider local and Regional economies, styles, and population levels in managing Forest lands? | | | X | | X |
| -- How much timber should be harvested and on what schedule on the Deschutes National Forest? | | | X | | X |
| -- How should the Deschutes National Forest provide for the present and future developed recreation? | | | X | | |
| -- How can the Forest keep pace with expanding demands for dispersed recreation? | | | X | | X |
| -- How should the Forest allocate and manage roadless areas? | | | X | | X |
| -- How should the Deschutes National Forest manage habitat for "threatened and endangered wildlife and botanical species?" | | | X | | |
| -- How should the Forest plan to meet future demands for use of firewood? | | | X | | X |
| -- What areas of the Forest should be made available for geothermal development? | | | X | | |
| -- Can the Forest meet the assigned Resources Planning Act targets? | | | X | | X |
| -- How should the Deschutes, Fremont, and Winema National Forests manage the ponderosa and lodgepole pine stands which are infested with mountain pine beetles and stands which are susceptible to infestations? | | | X | | X |

| | Deferred for Resolution Outside Planning Process | Treated Same Through-Out All Alternatives | Treated Differently In Design of Alternatives | | |
|---|---|---|---|---|---|
| | | | Allocations | S&G's | Scheduling |
| -- What level of plant and animal diversity should the Forest manage for? | | | X | | X |
| -- How can the Forest maintain scenic beauty while providing goods and services from the National Forest. | | | X | | X |
| -- What should wildlife populations be on the Deschutes National Forest? | | | X | | X |
| -- How should the Forest manage its rangelands and forage areas? | | | | | X |
| -- How should the Forest manage its lakes, streams, and wetlands to prevent degradation? | | X (S&G's) | | | |
| -- Should the Forest Service continue to use manmade chemicals for such purposes as vegetation manipulation, Forest insect and disease control, wildfire suppression, Forest fertilization, and maintenance of transportation and energy transmission rights-of-way. | | X (S&G's) | | | |
| -- To what extent should the Forest enhance or maintain soil productivity and control erosion? | | X (S&G's) | | | |
| -- How should the Forest identify and protect its cultural (archaeological and historical) resources? | | X (S&G's) | | | |
| --How should the Forest manage key roads, particularly those that cross the Cascade Crest? | | | | | |

## ISSUE NUMBER 1

## HOW SHOULD THE FOREST CONSIDER LOCAL AND REGIONAL ECONOMIES, LIFESTYLES, AND POPULATION LEVELS IN MANAGING FOREST LANDS?

Looking at the Issue:

1. To what extent should National goals and needs affect the local and Regional economies?
2. How will the level of Deschutes National Forest receipts affect the local tax base?
3. How will employment levels in industries that depend on the Forest be affected?
4. What are the tradeoffs within the local and Regional economies when one use of the Forest is emphasized over another?
5. Should the Forest be involved in efforts to manage or direct local growth and development?
6. How effective is Deschutes National Forest administration of Forest Service programs to aid the physically or economically disadvantaged?
7. How does the Deschutes National Forest maintain and improve Forest user relations?

Scope

Forest management decisions can affect the economic and social makeup of the Forest influence area.

Duration:

This is an ongoing concern.

Intensity:

Concern is high now, and as population and taxes rise concern will become even more intense.

Future Options:

Certain management decisions, such as building roads into roadless areas, are irreversible; others can be changed.

## Relationship to Other Issues

The economy and lifestyles of many local and regional people and businesses are tied to the Forest in many ways. Both tourists and permanent residents are attracted to the wide variety of recreation opportunities available on the Forest. Most often they come to hunt, fish, ski, camp, or boat. Some combine these activities with other recreation pursuits associated with recreation resorts.

The Forest provides wood for a significant forest products industry which provides jobs and contributes to a way of life for many people. Since many people use wood as their primary source of home heating, gathering firewood has become a part of the Central Oregon way of life. The issue concerning local and regional lifestyles and economies is at the center of all other issues. The way each of the following issues is treated has a bearing on this issue. For example how the mature lodgepole pine is treated has a bearing on firewood and the forest products industry which in turn affects the economies and lifestyles.

## ISSUE NUMBER 2

## HOW MUCH TIMBER SHOULD BE HARVESTED AND ON WHAT SCHEDULE ON THE DESCHUTES NATIONAL FOREST?

Looking at the Issue:

1. How much timber can the Forest produce on a sustained yield basis?

2. What methods of timber harvesting should be used?

3. Should the Forest increase investment in procedures that increase the rate of timber growth ("intensive management")? What does intensive management cost? How much additional timber is produced by intensive management? How would the Forest ecosystem be affected?

4. If the amount of timber cut on the Forest is changed from the present level, how would the local economy be affected? Would the allocation of harvest among the four Ranger Districts change?

5. What are the tradeoffs between timber production and Forest uses?

6. How should the Forest manage areas that have commercial timber on them now, but may be difficult to reforest?

7. Should all highly productive commercial timber land be allocated to timber production.

8. What are the effects of departing from nondeclining even flow?

9. What wood products will the Deschutes National Forest be producing?

Scope:

Timber harvest affects the whole Forest.

Duration:

Timber harvest planning will remain an issue for the foreseeable future.

Intensity:

This is a large local, Regional, and National issue.

Future Options:

Any decrease in the current annual harvest may result in a shortage of raw materials, causing decreased employment in the local timber industry in the near future. But cutting more lumber than the Forest can grow will lead to a shortage of raw materials in the more distant future, resulting in decreased employment.

## Relationship to Other Issues

Many people are concerned that the Forest might be developed as a tree farm with regard only for monetary and commodity values. The other side of the issue is that too much area might be tied up for uses other than timber production, thus diminishing the base for the forest products industry. The schedule of timber harvesting is also a concern. How fast should the remaining mature and old growth forests be harvested and converted to younger managed stands? This issue is directly linked to the lodgepole pine issue which follows.

## ISSUE NUMBER 3

HOW SHOULD THE DESCHUTES, FREMONT, AND WINEMA NATIONAL FORESTS MANAGE THE LODGEPOLE STANDS WHICH ARE INFESTED WITH MOUNTAIN PINE BEETLES AND STANDS WHICH ARE SUSCEPTIBLE TO INFESTATIONS?

### Looking at the Issue

1. How do we manage and protect the trees in important recreation areas from destruction by the mountain pine beetle?
2. How do we manage lodgepole pine in areas with high scenic values?
3. How rapidly could the mature stands be converted and still meet environmental and social concerns?
4. What standards and guidelines can be developed to provide for protection of soil, water, wildlife habitat, visual quality, etc?
5. How do we deal with the increased fire hazard associated with tree mortality caused by the mountain pine beetle?
6. How do we manage the lodgepole to prevent future epidemics?
7. How do we coordinate with adjacent land ownerships?
8. How do we utilize the material associated with lodgepole?
9. How do we sell material associated with lodgepole in light of uncertain markets and continually changing conditions within the lodgepole vegetative type?

### Scope:

This involves all the mature lodgepole on the Deschutes Plateau and has potential to spread to other species.

### Duration:

The epidemic is predicted to continue for 10-15 years.

### Intensity:

Most of the users of the Forests affected are concerned about the impacts of the epidemic and how the Forests will respond to it.

### Future Options:

Options to utilize the mature green lodgepole pine are decreasing annually. Much of the lodgepole may be dead and not usable in traditional markets.

## Relationship to Other Issues

The three National Forests are coordinating the management of lodgepole pine stands on approximately 500,000 acres of land. The stands are mostly in a mature or old growth condition. The older stands are infested with mountain pine beetles to the point that the situation is best described as an epidemic. Some stands are dead, some are dying, and others are susceptible to attacks. It is predicted that 80 percent of the mature stands, covering approximately 225,000 acres on the Deschutes National Forest, will be destroyed by the beetle by 1995.[2]

The issue regarding lodgepole pine has strong ties to other issues and the treatment of it could create new issues. The lodgepole situation has created an abundance of firewood and has been one of the catalysts to the growth of wood burning stoves for home heating. The main question regarding this issue is how fast to treat the mature lodgepole pine and what to use it for. If industry uses a large amount of it, then less will be available for personal or commercial firewood.

If a large amount of lodgepole pine are harvested in the next 10 years, then how much ponderosa pine should be harvested? Ponderosa pine is the most important species for timber industry so the amount of ponderosa pine in relation to lodgepole pine is of concern. How rapidly the lodgepole pine is treated is also the source of a new issue that is beginning to develop. As dying stands are harvested, hiding cover for big game is being reduced. There is concern that this increases the vulnerablility of deer during the fawning season and the hunting season. The thrust of this issue will be how to provide for the overall security of big game if hiding cover is reduced.

This issue is also related to recreation and visual quality. Stands along heavily used roads and in campgrounds are being killed. If the stands are treated to protect them or start new stands the visual quality will be reduced as well as the recreation experience.

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[2] Dolph, Robert E. and Filip, Gregory M. "Forest Insect and Disease Activity on the Deschutes National Forest and Guidelines for Preventing and/or Reducing Their Losses. Pacific Northwest Region, 1980.

## ISSUE NUMBER 4

## HOW SHOULD THE FOREST PLAN TO MEET FUTURE DEMANDS FOR USE OF WOOD AS AN ENERGY SOURCE?

Looking at the Issue:

1. How long will suitable wood be available for personal use in Central Oregon?

2. How long will the more desirable lodgepole pine firewood be available?

What kind of pricing strategy would we pursue?

How much commercial firewood would be made available which could potentially be removed from Central Oregon?

How much emphasis should be placed on administration and enforcement of the firewood program.

How much of the lodgepole supply, if any, should we allocate to the various firewood users.

7. Should we promote commercial use of mature lodgepole which could affect the supply that would be available for individual use.

Scope:

This concern is Forestwide, especially adjacent to Bend, LaPine, and Sisters.

Duration:

As the demand for alternate forms of energy increases, pressure on the Deschutes National Forest will also increase.

Intensity:

Concern is high since a large segment of the public is involved. Traditionally, people have been allowed free firewood use on the Forest.

Future Options:

Options threatened or affected are: management of wildlife, prompt regeneration, and loss of revenues due to illegal cutting of saw logs. Holding fuels for additional time increases fire hazard.

## Relationship to Other Issues

Nearly 60 percent of the homes in the central Oregon area are using wood to help heat their homes. An estimated 60,000 cords of personal use firewood are being consumed annually. Various commercial operations are using an additional 50,000 cords annually. These 110,000 cords equate to 9,000 loaded log trucks or enough lumber to build 3,900 single family homes per year. Most of this fuelwood is lodgepole pine. With the current use levels of firewood, regular timber sales, and the mountain pine beetle attacks, it is possible that the primary source of easy and accessible fuelwood as we know it today will be gone by 1995 to 1997. Several assumptions must be made in order to properly address this issue. One is that demand would remain near current levels and another is that firewood cutters would be willing to shift to sources other than lodgepole pine for firewood.

A part of the issue dealing with wildlife population levels is related to the firewood issue. A component of habitat for cavity dwelling speeies is dead trees. With the easy access on the Forest and high demand for firewood, this habitat can be affected.

## ISSUE NUMBER 5

## HOW SHOULD THE FOREST PROVIDE FOR PRESENT AND FUTURE DEVELOPED RECREATION?

Looking at the Issue:

1. Should the Forest encourage use of facilities during the off-season and weekdays?
2. Should the Forest provide "overflow" facilities during peak periods?
3. What are the conflicts between different recreation users?
4. Does the Forest have enough group reservation campgrounds.
5. Does the Forest have properly designed facilities in adequate numbers to accommodate the handicapped?
6. Are day-use parking facilities adequate?
7. How does the Forest determine the needs and wants of the Forest visitor.
8. How does the Forest monitor the quantity and quality of user experiences?
9. Is the Forest going to limit use to the level that does not exceed the carrying capacity of the site?
10. What are the "green space" requirements for camping in recreation complexes?
11. Is access to winter sports areas adequate?
12. Is the Forest providing recreational opportunities that should be provided by the private sector?
13. Does the Forest need additional overnight and day-use developed facilities?
14. What are the opportunities for the public to provide voluntary assistance in building campground facilities, etc.?
15. What is the Forest's capability for developed winter sports, and how much area should be allocated for these uses?
16. What are the tradeoffs between developed recreation use and production of other goods and services from the Forest?
17. Is there a need to provide facilities for Forest recreation groups, i.e., horse groups, backpackers, trailers, ORV, etc.?
18. What are the future demands (and opportunities) for developed recreation?

Scope:

Involves present and potential developed sites Forestwide.

Duration:

This concern will continue to be a consideration as recreation use grows.

Intensity:

Recreation is the biggest direct use on the Forest by the general public. The intensity varies with the fluctuation in use: more intense on long weekends, through summer and winter seasons.

Future Options:

Options for development will remain open, although they depend upon other land uses. Once a site is developed, the land it occupies remains committed for a long time.

## Relationship to Other Issues

Developed recreation, i.e., recreation occurring within a site or facility, takes on many forms, ranging from the Mount Bachelor Ski Area to small isolated picnic grounds. Demand for more camping, boating, and other recreation pursuits requiring facilities and resulting in concentrations of people is continuing to grow. Destination resorts adjacent to the Forest also attract many recreationists to the area. Two questions need to be addressed--which areas should be managed as developed recreation sites and how many acres they should include. Many of the attractive recreation areas are associated with lakes, rivers, and streams. Development may introduce potential for water polution, could alter riparian or wildlife habitat, or result in structures which alter the natural beauty of an area. An increase in developed recreation sites would allow more people to enjoy the Forest.

This issue is related to the issue regarding lifestyles since recreation is an important aspect of living in Central Oregon. It also makes contributions to revenues and employment. There is also a relationship between this issue and habitat for some wildlife species. Habitat for bald eagles and osprey often occurs in the same areas which could provide good developed recreation opportunities. How the vegetation is managed, particularly trees, could affect the issue regarding the level of timber harvesting.

## ISSUE NUMBER 6

## HOW CAN THE FOREST KEEP PACE WITH EXPANDING DEMANDS FOR DISPERSED RECREATION?*

### Looking at the Issue

1. Do we need a complete inventory of dispersed use, including winter recreation?
2. Can we differentiate between dispersed recreation campers and homesteaders?
3. What types of access are needed?
4. Can we manage to allow more intensive use of dispersed areas while maintaining their quality.
5. How many new facilities are needed?
6. What are the tradeoffs between dispersed recreation use and the production of other goods and services from the Forest?
7. How do we manage for special recreation groups, i.e., ORV, horse, snowmobile, cross-country skiing, etc.?
8. What are the demands and their trends for the various dispersed recreational activities?
9. Where should the Forest provide areas and facilities for ORV (motorcycles, four-wheel drive vehicles, snowmobiles) use?

### Scope:

Some form of dispersed recreation takes place almost everywhere on the Forest.

### Duration:

As long as the public feels the need for dispersed recreation.

### Intensity:

This concerns a large section of the recreation public.

### Future Options:

Options may be limited due to resource damage from unregulated use or compromised by other resource uses.

*Dispersed recreation refers to roaded and unroaded areas, activities including sightseeing, hiking, camping, fishing, hunting, etc., which does not utilize developed recreational facilities such as resorts, campgrounds, boat docks, and toilets. Use of trails and roads is considered dispersed recreation. Dispersed recreational use is fairly widespread across the Forest, while developed recreational use tends to concentrate use in specific areas.

## Relationship to Other Issues

Hiking, rafting, fishing, snowmobiling, sailing, hunting, driving for pleasure, caving, and mountain climbing, are all popular dispersed recreational activities. Some recreational activities occur in exclusive areas of the Forest such as designated Wilderness. Others, such as cross country skiing and snowmobiling, occur in the same areas and conflicts between users can and do occur. How to zone the Forest to provide for dispersed recreation activities while minimizing conflicts is the heart of this issue.

An aspect of dispersed recreation is "undeveloped recreation". This is recreation without roads, campgrounds, or other developments. This type of recreation is currently available in existing Wilderness, the Oregon Cascade Recreation Area, and roadless areas. In this sense, the issue is related to the roadless area issue since development of roadless areas could reduce the opportunity for undeveloped recreation.

## ISSUE NUMBER 7

## HOW CAN THE FOREST MAINTAIN SCENIC BEAUTY WHILE PROVIDING FOR TIMBER PRODUCTION AND OTHER GOODS AND SERVICES?

### Looking at the Issue:

1. What does the public consider as scenic beauty?
2. Are there places where scenic beauty needs to be restored?
3. Do current practices for growing and harvesting timber maintain or enhance scenic beauty?
4. How will the need to maintain beautiful scenery change as public use of the Forest develops?
5. Should the Forest maintain scenery on Forest land adjacent to private ownership?
6. What large expanses of scenery may require unified planning in order to maintain their appearance ("viewshed planning")?

### Scope:

The whole Forest provides some degree of scenic value, but concern over beautiful scenery is greatest where public use is heaviest.

### Duration:

The appearance of the Forest will remain an ongoing concern.

### Intensity:

Drastic changes in the natural scenery may easily provoke high-intensity public concern.

### Future Options:

As public use patterns change, the need to maintain beautiful scenery may also vary.

## Relationship to Other Issues

The high recreational values of the Forest are directly linked to its beautiful scenery. Viewing volcanic peaks along the Cascade Crest, large ponderosa pine trees along major roads, and free flowing rivers are all part of the recreation experience. Views from lakes and campgrounds can affect the experience of the recreationist. Many people prefer to view natural appearing landscapes rather than ones where timber harvesting dominates. The key to this issue is to determine which areas should be managed for their natural beauty. Another aspect of the issue is how to manage areas with high visual values.

## ISSUE NUMBER 8

## HOW SHOULD THE FOREST MANAGE ROADLESS AREAS?

Looking at the Issue:

1. What tradeoffs are associated with wilderness designations?

2. How should roadless areas be managed to complement the total recreation opportunity on the Forest?

3. What influence should the current mountain pine beetle epidemic have on allocating roadless areas?

4. In how much of the roadless areas should we designate as Wilderness?

5. How much of the roadless areas should we designate as motorized, dispersed recreation.

6. How much of the roadless areas should we designate as nonmotorized dispersed recreation.

7. How much of the roadless areas should we designate as developed recreation?

8. Is managing the roadless areas for wood production economically efficient?

9. How much emphasis should the potential for geothermal development have on allocating roadless areas to various uses?

Scope:

Roadless areas throughout the Forest may require planning.

Duration:

Roadless areas will remain controversial for the foreseeable future.

Intensity:

Debate over the future of roadless areas has been heated in the recent past and may continue.

Future Options:

Realistically, building roads into an area is an action that would limit future wilderness options.

## Relationship to Other Issues

The passage of the Oregon Wilderness Act in 1984 left the Forest with 145,142 acres of roadless areas. The Act released these areas for multiple use management. The thrust of this issue is whether these acres should remain roadless. Public comments on individual roadless areas showed a high level of concern for keeping some areas in a roadless condition because of the unique values associated with them.

The roadless areas are related to the other issues in that some have potential resources such as geothermal, timber, and motorized recreation, which would require roading to utilize or have access to these resources.

## ISSUE NUMBER 9

### HOW SHOULD THE FOREST IDENTIFY AND PROTECT ITS CULTURAL (ARCHAEOLOGICAL AND HISTORICAL) RESOURCES?

Looking at the Issue:

1. How does the Forest identify, protect, rehabilitate, or study cultural resources.

Scope:

The scope of cultural resources on the Forest is unknown.

Duration:

This will remain a concern until all cultural resources on the Forest have been located.

Intensity:

This is of concern to the Government and the public.

Future Options:

This is a nonrenewable resource. Once it is destroyed, it is lost forever.

## Relationship to Other Issues

Over 600 scientifically and historically valuable cultural resources are identified on the Forest. Over 50 new sites, mainly comprising prehistoric Indian campsites, are found each year as a result of the Forest's cultural resource inventory program. Cultural sites located in project areas such as timber harvest units or recreation sites are usually protected by designing activities around them, though a few mitigation projects have occurred. Known sites are checked periodically in an atttempt to prevent illegal artifact collecting and vandalism which is a serious problem on the Forest. Cultural resources are an issue in the sense that many people, especially local residents, are concerned about how many and how adequately cultural sites are being preserved and protected in the face of all the ground-disturbing projects and cultural resource vandalism that occurs on the Forest.

This issue is directly related to the issue of how much timber should be harvested and on what schedule since that activity effects more area than other activities.

## ISSUE NUMBER 10

HOW SHOULD THE DESCHUTES NATIONAL FOREST MANAGE HABITAT FOR "THREATENED, ENDANGERED, OR SENSITIVE SPECIES?"

Looking at the Issue:

1. How much and where is habitat needed?
2. What will be the effect of habitat management?
3. Do we have the knowledge needed to manage these species?
4. Should management for threatened and endangered wildlife and botanical species override management for other kinds of Forest uses?
5. What are the population objectives for threatened and endangered species?

Scope:

Known habitat occurs in scattered, localized areas on the Forest.

Duration:

As long as the Forest is habitat for threatened and endangered species, this will be a concern.

Intensity:

This is an important issue to the general public.

Future Options:

Future options will be limited by present management decisions. New species may be designated and provisions made.

## Relationship to Other Issues

The Bald Eagle, which is listed by the U.S. Fish and Wildlife Service as threatened species, is present on the Forest. Fifteen to 20 pairs of bald eagles are currently nesting on the Forest. The habitat could potentially support 50 pairs. Nesting and feeding areas are important habitat for eagles. The Forest also has habitat for the northern spotted owl which is classified as a Sensitive species. Currently 11 pairs of spotted owls are present and there is potentially habitat to support 12 pairs. The issue is how many pairs of eagles and owls we should provide old growth habitat for. The Peregrine Falcon, which is listed by the U.S. Fish and Wildlife as endangered species, has been reported on the Forest but no nest sites have been located.

There are 16 plants classified as Sensitive Species known to exist on the Forest and the presence of 8 others is suspected.

ISSUE NUMBER 11

## WHAT SHOULD WILDLIFE POPULATIONS BE ON THE DESCHUTES NATIONAL FOREST?

Looking at the Issue:

1. How do Forest management practices affect wildlife?
2. What are the current wildlife populations?
3. How much wildlife habitat is there?
4. What areas are critical to maintaining wildlife populations? For example, where are the spring, summer, fall, and winter deer ranges?
5. How can the Forest provide an ongoing supply of habitat for cavity-nesting birds?
6. What is the potential fishery resource on the Forest?
7. Should the Forest manage its lands to meet wildlife goals set by other Federal and State agencies?

Scope:

Virtually the entire Forest is inhabited by some kind of wildlife. Some areas may be very important to maintaining wildlife populations.

Duration:

Legislation and interested public groups and individuals make this an ongoing concern.

Intensity:

The level of concern is variable, depending on the perception of wildlife population levels and cycles by public groups and Government agencies.

Future Options:

As long as residual populations remain large enough to perpetuate themselves, options to provide habitat will be kept open.

## Relationship to Other Issues

The public, the Forest, and the Oregon Department of Fish and Wildlife are concerned about several species which are listed below with their currently estimated populations. They are: mule deer (20,300), elk (500 to 700), and osprey (125) pairs. Other species of concern include goshawks, pine martens, and woodpeckers. The question for all the species is what level of emphasis should the Forest place on maintaining or improving habitat for these species?

This issue is related to the timber issue in that providing habitat can be done by using different techniques including timber management. When the trees are manipulated to achieve the desired habitat conditions, timber yields can be reduced below their potential. This issue is also related to the recreation issue since wildlife is a source of recreation or it can restrict it in order to protect wildlife and its habitat.

## ISSUE NUMBER 12

## WHAT LEVEL OF OLD GROWTH SHOULD THE FOREST MANAGE FOR?

Looking at the Issue:

1. Diversity can be created by timber harvest methods and size of treatment areas. What opportunities or limitations should apply to timber harvest activities.
2. Managing vegetation to promote diversity conflicts with growing timber on highly productive land, what goal should the Deschutes National Forest try to emphasize?
3. What tree species, tree sizes, tree ages, and stand densities are needed on the Forest?
4. How much vegetation change should occur on a unit of land during the forthcoming 10-year planning period?
5. Fire can contribute to the creation and maintenance of diverse vegetation. What are the opportunities or limitations to use prescribed fire or to allow unplanned fires to burn in order to promote diversity?
6. Are grazing activities affecting plant and animal diversity, particularly along streams and lakes?
7. Construction activities, such as roads, rockpits, campgrounds, reservoirs, and utility corridors all create a kind of manmade diversity. How are these developments reducing or altering the Forest's abilities to manage for diversity?
8. How much emphasis should be placed on the introduction of non-native species?
9. How much old-growth area is enough, and how should it be managed?
    a. What is the basis for the 3 percent old-growth allocation on the Forest?
    b. How should the Forest define the term "old-growth area?"
    c. How much old-growth area is needed to provide for wildlife and plant diversity and preservation of original gene pools?
    d. Will management of old growth require a special allocation of Forest land for replacement areas?

Scope:

Diversity must be considered over the whole Forest, including lands held by others adjacent to the Forest.

Duration:

Short-range activities can cause long-range effects on the Forest's diversity.

Intensity:

Concern about diversity is increasing. Both the Resources Planning Act and the National Forest Management Act establish the needs to determine and manage for diversity.

Future Options:

Today's activities can reduce or eliminate elements of diversity in the future.

## Relationship to Other Issues

Old growth is important to many people for reasons ranging from concerns about wildlife, genetics, and scenic quality. Just keeping some of the old growth is important to people as well as protecting future options. The thrust of this issue is how much old growth should be provided and how it should be distributed.

This issue relates to the issue regarding spotted owl and bald eagle. Habitat for those species is old growth or old trees. By providing for habitat for those species, some old growth will occur. The same is true for undeveloped recreation where natural processes are allowed to operate. Providing for old growth affects the timber issue since harvesting of timber is normally not compatible with old growth goals.

## ISSUE NUMBER 13

## CAN THE FOREST MEET THE ASSIGNED RESOURCES PLANNING ACT TARGETS?

Looking at the Issue:

1. If we cannot meet the targets, what criteria will be used to determine which targets will not be met?

Scope:

Involves the entire Forest.

Duration:

The RPA targets will be a continuous concern in Regional Planning.

Intensity:

The intensity will probably increase when decisions are made on targets.

Future Option:

Future options could be lost when targets are assigned.

## Relationship to Other Issues

The Regional Guide established targets for the Deschutes National Forest of 214 million board feet (MMBF) of timber, 36,000 animal unit months (AUM's) of domestic livestock grazing, 2050 thousand recreation visitor days (MRVD's) of developed recreation, 1930 MRVD's dispersed recreation, and 1275 acres of wildlife habitat improvement. The Forest must determine if it is capable of producing these outputs within acceptable social and environmental limits.

Meeting the Resources Planning Act targets is directly related to the timber, recreation, and wildlife issue. It is also indirectly related to some of the other issues such as firewood and roadless areas.

## ISSUE NUMBER 14

## WHAT AREAS OF THE FOREST SHOULD BE MADE AVAILABLE FOR GEOTHERMAL LEASING AND DEVELOPMENT?

### Looking at the Issue:

1. How much leasing should be allowed and in what locations?
2. What will be the effect of leasing on other Forest resources?

### Scope:

Exploration and development primarily affects areas with geothermal potential, such as Newberry Crater, and areas along the crest of the Cascades.

### Duration:

In the event that geothermal energy becomes a viable energy resource, it will remain in demand until it is no longer feasible, or the resource is depleted.

### Intensity:

The public has expressed a concern about sensitive areas in previous planning input processes.

### Future Options:

If geothermal leasing takes place, there could be an effect on other resource values, particularly visual, water quality, and recreation. Leases will provide priority for geothermal development over other resources within the lease area.

## Relationship to Other Issues

The Deschutes National Forest is considered to have some of the greatest potential for geothermal resources of any area in the Western United States. Approximately 350,000 acres have already been leased. The Newberry Crater is designated as a Known Geothermal Resource Area (KGRA). It is also a National Natural Landmark. Hot fluids have been located near the surface within the Crater. The interior of the Crater is an important recreation area with two large lakes known for their fishing. Campgrounds and resorts are located adjacent to the lakes. The area is also a popular winter sports area with snowmobiling and cross country skiing. There is an active bald eagle nesting territory within the Crater. Numerous unique geological features are also found within the Crater such as world famous obsidian flows. There are also other areas on the Forest which could be leased that are currently not leased. The main thrust of this issue is where and under what conditions should leases be issued and how to protect recreation, visual, wildlife, water quality, and other resource values.

This issue is also related to the roadless area issue since some of the highest potential for geothermal development lies within some roadless areas.

## ISSUE NUMBER 15

HOW SHOULD THE DESCHUTES NATIONAL FOREST MANAGE KEY ROADS, PARTICULARLY THOSE LOWER STANDARD ROADS THAT CROSS THE CASCADE CREST?

### Looking at the Issue

1. Three fairly low standard roads currently crossing the Cascade Crest could be upgraded to provide for higher traffic use. They are the Irish-Taylor Road, the Waldo-Forest Highway 46, and Windigo Pass Road. Should these roads be upgraded?
2. Should the Windigo Pass Road, which is a corridor between two portions of the Oregon Cascade Recreation Area, be upgraded and evaluated as a possible Forest Highway?
3. Should the Irish-Taylor Road, which lies adjacent to the southern boundary of the Three Sisters Wilderness Area be improved or left in its present condition.
4. Should Forest Highway 46 be paved to improve access to Waldo Lake.
5. Should the road between Todd Lake and Three Creeks Lake be closed, maintained in its present, or improved?
6. Should snowmobiles be permitted on these roads?

### Scope

This issue affects people from both the Central Oregon area and the Willamette Valley.

### Duration

The issues surrounding these roads will continue into the foreseeable future.

## Relationship to Other Issues

The Windigo Pass, Waldo Lake, Irish-Taylor, and Todd Lake to Three Creeks Lake roads have been the center of controversy in the past. The primary issues have been whether the roads should be improved to provide additional vehicle use and more direct routes to points west of the Cascades. All of the roads are currently adjacent to Wilderness, the Oregon Cascade Recreation Area, or roadless areas. Improving the roads could affect use levels in these areas. The Windigo Pass and Waldo Lake roads have been considered as possible future highways.

## ISSUE NUMBER 16

HOW SHOULD THE FOREST PROTECT VEGETATION FROM DAMAGE BY FOREST PESTS?

Looking at the Issue:

1. How many acres on the Forest would benefit from the use of chemicals?
2. Are there alternatives to using pesticides on the Forest?
3. What effect will not using pesticides have on the Forest outputs?
4. What are the effects on other resource values if pesticides are used?

Scope:

This is a Forest and Regional Issue.

Duration:

This appears to be an ongoing concern.

Intensity:

The Issue is very intense Regionally.

## Relationship to Other Issues

Pesticides currently used on the Forest include Big Game Repellent (BGR) and strychnine alkaloid. BGR is a deer repellent made of eggs to protect newly planted trees. It is applied to approximately 5000 acres per year. Strychnine is applied underground to reduce gopher populations in some plantations which receive heavy tree loss from gophers. This also is applied to about 5000 acres annually. Herbicides to control vegetation were applied to about 800 acres annually prior to the Court enjoining the Forest Service from the use of herbicides. No insecticides have been used recently and are not being used to control the mountain pine beetle. Insects such as spruce bud worm and tussock moth are present both on National Forest land and on adjacent lands and could pose a future threat. The result could be an expanded need to consider the use of insecticides in the future. The thrust of this issue is whether use of pesticides to control pests is appropriate or whether alternatives treatments should be used.

## ISSUE NUMBER 17

## HOW SHOULD THE FOREST MANAGE ITS LAKES, STREAMS, AND WETLANDS TO PREVENT DEGRADATION?

### Looking at the Issue:

1. Is there a need to control streambank erosion on the Deschutes River?
2. Should streamside and lakeside zones be developed?
3. Is there a need for greenbelts along shores?
4. Are cattle and horses causing damage to streambanks and water quality?
5. Is recreational use of waters a problem?
    - a. Do motorized vehicles on shores, banks, and water cause damage?
    - b. Is pollution associated with recreation use?
    - c. Should access be controlled to protect some areas?
6. Is natural and manmade debris a problem in streams?
7. Are additional flood control measures needed?
8. What tradeoffs between water quality protection and production of goods and services from the Forest are acceptable?

### Scope:

Many streams and lakes are scattered throughout the Forest.

### Duration:

This will be an ongoing concern.

### Intensity:

This is a high-intensity concern because it covers a broad spectrum: recreation, wildlife, and water quality.

### Future Options:

If degradation is not prevented, the quality of marshes, lakes, and streams may deteriorate to an irretrievable point.

## Relationship to Other Issues

Water quality monitoring conducted over the past 10 years by the U.S. Forest Service, Department of Environmental Quality, and the Department of Fish and Wildlife has shown the surface waters on the Deschutes National Forest to be well within the levels specified by the State water quality standards for the Deschutes River basin. The guidelines and management policies which have been used in the past to guide management along streamsides have prevented significant damage and the riparian zones are in good condition. Past evaluations of channel stability on the Deschutes NF showed that the streams have small localized instability problems but are in good condition generally. This is an issue because people who live and visit the area place great value on the existing level of water quality and want to protect and maintain it.

## ISSUE NUMBER 18

## TO WHAT EXTENT SHOULD THE FOREST ENHANCE OR MAINTAIN SOIL PRODUCTIVITY AND CONTROL EROSION?

### Looking at the Issue:

1. How productive is the soil in the Deschutes National Forest now?
2. Is the Forest fully using the available productivity of its soils?
3. Is soil productivity decreasing?
4. Should the Forest try to enhance the productivity of National Forest soils?
5. Are some activities causing soil erosion or soil compaction, leading to lower productivity or to lower water quality?
6. Are present timber harvesting methods damaging the soil?
7. What should the Forest do if fluctuating reservoir or river water levels cause shoreline or streambank erosion?
8. Should the Forest dispose of nonproductive problem soils through land exchange or sale?

### Scope:

The ability of the Forest to provide all goods and services depends on the productivity of its soil.

### Duration:

Soil productivity will remain an ongoing concern.

### Intensity:

The degree of concern will depend on how people perceive that the Forest is maintaining the resource.

### Future Options:

Soils develop slowly, so most productivity losses cannot be repaired easily.

## Relationship to Other Issues

Due to the volcanic origin of the soils on the Deschutes NF and the gentle terrain, there are very few of the traditional soil problems. The Soil Resource Inventory for the Forest shows that the majority of the area is rated as low to moderate in terms of surface erosion potential. There are small localized instances of mass failure but these are isolated and very rare. Compaction is not a problem on most of the Forest due to an overburden of pumice. There are compaction problems on the north portion of the Forest where the soils are more developed and weathered. Displacement of the surface soils is a problem due to the natural lack of cohesion of the coarse textured surface soil particles. Generally, the issue dealing with soils is tied to the protection of the surface soil and maintenance or improvement of productivity wherever possible.

## IV. Issues Which Vary Significantly Between Alternatives

The previously discussed issues are addressed in each of the Alternatives. Some, such as the issues related to soils and water, do not vary since they are treated with standards and guidelines equally in all Alternatives. Others vary greatly between Alternatives and become important in evaluating the Alternatives and overall net public benefits. Issues which vary significantly and how they were quantified follow:.

1. How can the Forest meet the assigned Resource Planning Act targets?

   There are five specific RPA program areas which the Deschutes evaluated. Program levels for outputs of timber, range, wildlife habitat improvement, dispersed and developed recreation were established in the Regional Guide for the Pacific Northwest Region for the Deschutes Forest. Timber outputs are measured by millions of cubic feet per year. Range is measured by thousands of animal unit months per year. Wildlife habitat improvement is measured by acre equivelants of habitat improvement per year. Dispersed and developed recreation are measured by thousands of recreation vistor days of use per year.

2. How should the Forest consider local and regional economies, lifestyles, and population levels in managing Forest lands?

   Many things affect the lifestyles and economy which are related to the Forest. The key outputs and how they were quantified follow:

   Jobs--as a measure of changes in the number of jobs compared to current direction.

   Revenues to Counties--measured in millions of dollars per year.

   Diversity of recreation opportunity--measured in acres available for different experiences with a focus on undeveloped recreation.

   Personal use firewood--measured in thousands of cords available per year.

   Visual quality--measured in acres of retention and partial retention protected.

3. How should the Forest plan to meet future demands for use of wood as an energy source?

   As stated in the previous issue, cords of firewood available is the measure. Also linked to this is the question of whether personal use firewood users will be ensured of being able to get a specific amount or whether they must compete for the material in an open market.

4. How should the Forest provide for developed and dispersed recreation?

   As discussed in previous issues this is quantified by RVD's and acres of opportunity available. Also linked to this is acres of visual quality.

5. How can the Forest maintain scenic beauty while providing goods and services?

   As previously discussed, this is quantified by acres of retention and partial retention that would be protected. Where the acres are is possibly more important than the total number of acres.

6. What should wildlife populations be?

   For mule deer this is quantified by numbers of deer the habitat provided can support. For birds such as osprey and bald eagles it is quantified by the number of pairs the habitat can support.

7. What areas on the Forest should be made available for geothermal leasing and development?

   This is quantified by the acres of high, moderate, or low potential areas available for leasing.

# APPENDIX B

## DESCRIPTION OF THE ANALYSIS PROCESS

## I. INTRODUCTION

### A. Planning Problem

The Forest Service is responsible for determining how best to manage National Forest lands based on public desires and land capabilities.

The Deschutes National Forest is a 1.6 million acre wonderland of sculptured peaks, tumbling waterfalls, crystal clear lakes and rivers, hundreds of species of wildlife and fish, five designated wildernesses and a specially classified recreation area, and possibly the best variety of volcanic formations anywhere on this continent.

The Cascade Range on the western edge of the Forest provides a scenic backdrop for the flat, desert areas on the eastern fringe of the Forest. Elevations range from 2000 feet at Lake Billy Chinook to 10497 feet at Mt. Jefferson, the second tallest peak in Oregon. Diamond Peak, Mt. Washington, Mt. Jefferson, Three Sisters, and Mt. Thielsen Wildernesses cover 182,501 acres. The Oregon Cascade Recreation Area covers 42,656 acres.

Two major rivers, the Deschutes and Metolius, flow through the Forest. There are over 300 lakes, and several reservoirs. Over 212 million board feet of timber were harvested from ponderosa and lodgepole pine and mixed conifer timber stands which cover 71 percent of the forest land. Juniper and other non-forested lands make up the other 29 percent. Of the usable rangeland, 32 percent is used to graze 29,000 animal unit months of cattle and sheep. Nearly 350 species of fish and wildlife, including several threatened and endangered species of birds and mammals, live on the Forest.

Volcanic activity occurred as recently as 1300 years ago when obsidian flowed from Newberyy Volcano. Newberry Volcano, 500 square miles in area, collapsed to form Newberry Crater during the ice age. It is the largest such volcano in Oregon. Other areas of special interest are Lava Cast Forest, where tree molds or casts were formed by molten lava flowing through a timber stand. It is one of the finest cast collections in the western hemisphere. Lava River Cave is a mile long lava tube and one of the longest in the northwest.

The sunny, dry climate and clean air and the rich diversity of recreation opportunities attract over 2.5 million visitor days each year. People come from all over the world to fish and hunt; hike and mountain climb; camp and picnic; sail, canoe, and water ski; explore caves; and cut firewood in the summer. They come to downhill ski nearly year round on 9,065 foot Mt. Bachelor at one of the largest ski areas in the Pacific northwest. Cross country skiing and snowmobiling are popular winter sports.

The Forest lies mostly in Deschutes County but extends into Jefferson County on the north and into Klamath and Lake Counties on the south. Over 1.85 million acres lie within the Forest boundary; of these, 1.6 million acres are National Forest lands.

The mainstays of the economy are recreation and timber. The largest cities in the area are Bend and Redmond. Madras, Sisters, LaPine, Crescent, Sunriver, and Gilchrist are other important population centers. Forest headquarters and two Ranger District offices are located in Bend. Ranger District offices are also located in Sisters and Crescent. The Redmond Air Center, located at the Redmond Airport, and the Bend Pine Nursery are also part of the Deschutes National Forest organization.

Principal highways serving the area are U.S. 97, a north-south route, and U.S. 20, an east-west route. Other forms of transportation access include a commerical busline and Roberts Air Field near Redmond, which accommodates commerical airline services. A railroad serves the area, but passenger service is only provided at Chemult, 70 miles south of Bend.

Public interest includes divergent viewpoints about the use of market commodities such a timber, grazing, energy, and nonmarket commodities such as wilderness, unroaded recreation, scenery, wildlife, old-growth, and habitat diversity. The Forests's major planning goal is to provide enough information to help decisionmakers determine which combination of goods, services, and land uses will maximize net public benefit. (This concept is further discussed in Section IV of this Appendix.) The National Forest Management Act (NFMA) and the regulations developed under NFMA (36 CFR 219) provide the analytical framework to address this objective; they also state that the requirements of the National Environmental Policy Act (NEPA) and its regulations (40 CFR 1500-1508) must be applied in this analysis process.

## B. Planning Process

The planning and environmental analysis process brings a new outlook and a new technology to National Forest land management, principally: (1) processes formerly used to make individual resource decisions are now combined to help make integrated resource management decisions, and (2) new mathematical modeling techniques are used to assist in the proposed land use problem, including identifying the most cost-efficient pattern of land management. The 10-step planning process is discussed in the NFMA regulations and in Chapter I of this document. Appendix B describes the analysis phase of this process covering steps 3, 4, 5, and 6. The judgment phase, steps 1, 2, 7, and 8, is described in Chapters I, II, and in Appendix A of the DEIS. The execution phase, steps 9 and 10, is presented in the Proposed Forest Plan.

Public issues and management concerns are key to all steps and are presented here so that one can understand the background for some of the analysis and in particular, the Alternatives.

### Relationship of Issues

The following section first states the issue and then explains how it relates to the other issues.

-- How should the Forest consider local and regional economies, lifestyles, and population levels in managing Forest lands?

The economy and lifestyles of many local and regional people and businesses are tied to the Forest in many ways. Both tourists and permanent residents are attracted to the wide variety of recreation opportunities available on the Forest. Most often they come to hunt, fish, ski, camp, or boat. Some combine these activities with other recreation pursuits associated with recreation resorts.

The Forest provides wood for a significant forest products industry which provides jobs and contributes to a way of life for many people. Since many people use wood as their primary source of home heating, gathering firewood has become a part of the Central Oregon way of life. The issue concerning local and regional lifestyles and economies is at the center of all other issues. The way each of the following issues is treated has a bearing on this issue. For example how the mature lodgepole pine is treated has a bearing on firewood and the forest products industry which in turn affects the economies and lifestyles.

-- How much timber should be harvested and on what schedule?

Many people are concerned that the Forest might be developed as a tree farm with regard only for monetary and commodity values. The other side of the issue is that too much area might be tied up for uses other than timber production, thus diminishing the base for the forest products industry. The schedule of timber harvesting is also a concern. How fast should the remaining mature and old growth forests be harvested and converted to younger managed stands? This issue is directly linked to the lodgepole pine issue which follows.

-- How should the Deschutes, Winema, and Fremont National Forests manage the lodgepole pine stands which are infested with mountain pine beetles and stands which are susceptible to infestations?

The three National Forests are coordinating the management of lodgepole pine stands on approximately 500,000 acres of land. The stands are mostly in a mature or old growth condition. The older stands are infested with mountain pine beetles to the point that the situation is best described as an epidemic. Some stands are dead, some are dying, and others are susceptible to attacks. It is predicted that all mature stands, covering approximately 225,000 acres on the Deschutes National Forest, will be destroyed by the beetle in the next 10 years. This situation has created an abundance of firewood and has been one of the catalysts to the growth of wood burning stoves for home heating. The main question regarding this issue is how fast to treat the mature lodgepole pine and what to use it for. If industry uses a large amount of it, then less will be available for personal or commercial firewood. If a large amount of lodgepole pine is harvested in the next 10 years, then how much ponderosa pine should be harvested? How this issue is addressed affects the firewood issue.

-- How should the Forest plan to meet future demands for use of wood as an energy source?

Nearly 60 percent of the homes in the central Oregon area are using wood to help heat their homes. An estimated 60,000 cords of personal use firewood are being consumed annually. Various commerical operations are providing an additional 50,000 cords are annually. These 110,000 cords equate to 9,000 loaded log trucks or enough lumber to build 3,900 single family homes per year. Most of this fuelwood is lodgepole pine. With the current use levels of firewood, regular timber sales, and the mountain pine beetle attacks, it is possible that the primary source of easy and accessible fuelwood as we know it today will be gone in 10 to 12 years. To properly address this issue, one must make several assumptions. One is that demand would remain near current levels and another is that firewood cutters would be willing to shift to sources other than lodgepole pine for firewood.

-- How should the Forest provide for present and future developed recreation?

Developed recreation on the Forest takes on many forms, ranging from the Mount Bachelor Ski Area to small isolated picnic grounds. Demand for more camping, boating, and other recreation pursuits requiring facilities and resulting in concentrations of people is continuing to grow. Destination resorts adjacent to the Forest also attract many recreationists to the area. Two questions need to be addressed--which areas should be managed as developed recreation sites and how many acres they should include. Many of the attractive recreation areas are associated with lakes, rivers, and streams. Development may introduce potential for water polution, could alter riparian or wildlife habitat, or result in structures which alter the natural beauty of an area. An increase in developed recreation sites would allow more people to enjoy the Forest and could increase, to some degree, revenues and employment.

-- How can the Forest keep pace with expanding demands for dispersed recreation?

Hiking, rafting, fishing, snowmobiling, sailing, hunting, driving for pleasure, caving, mountain climbing, and general goofing off are all popular dispersed recreational activities. Some of the recreational activities occur in exclusive areas of the Forest. Others, such as cross country skiing and snowmobiling, occur in the same areas and conflicts can occur. The use of boats can either conflict with the fishing experience or enhance it. How to zone the Forest to provide for dispersed recreation activities while minimizing conflicts is the heart of this issue.

-- How can the Forest maintain scenic beauty while providing goods and services?

The high recreational values of the Forest are directly linked to its beautiful scenery. Viewing volcanic peaks along the Cascade Crest, large ponderosa pine trees along major roads, and free flowing rivers are all part of the recreation experience. Views from lakes and campgrounds can affect the experience of the recreationist. Many people prefer to view natural appearing landscapes rather than ones where timber harvesting dominates. The key to this issue is to determine which areas should be managed for their natural beauty. Another aspect of the issue is how to manage areas with high visual values.

-- How should the Forest allocate and manage roadless areas?

With the passage of the Oregon Wilderness Bill in 1984, the Forest has 150,000 acres of roadless areas left. The thrust of this issue is whether these remaining roadless areas should be developed or retained in an undeveloped condition. National Forests have been directed to not consider them for Wildernesss in this round of Forest Planning. Public comments on individual roadless areas showed a high level of concern for keeping some areas in a roadless condition because of the unique values associated with them. Some of these areas were not included in the Oregon Wilderness Bill. Some of the roadless areas have potential resources such as geothermal, timber, and motorized recreation, which would require roading to utilize or have access to them. A wide range of choices regarding the roadless area is presented in the Alternatives.

-- How should the Forest manage habitat for threatened, endangered, or sensitive species?

Two species listed in the Federal Register are present--the Bald Eagle which is threatened and the Peregrine Falcon which is endangered. Nesting and feeding areas are important habitat for eagles. No nesting habitat has been located for the peregrine falcon. The Forest also has habitat for the northern spotted owl which is classified as a Sensitive species. Fifteen to 20 pairs of bald eagles are currently nesting on the Forest. The habitat could potentially support 40-45 pairs. Currently 11 pairs of spotted owls are present and there is potentially habitat to support 12 pairs. The issue is how many pairs of eagles and owls we should provide old growth habitat for.

One plant classified as Sensitive is present.

-- What should wildlife populations be?

The public, the Forest, and the Oregon Department of Fish and Wildlife are concerned about several species which are listed below with their currently estimated populations. They are: mule deer (22,800), elk (500 to 700), and osprey (125) pairs. Other species include goshawks, pine martens, and woodpeckers. The question for all the species is what level of emphasis should the Forest place on maintaining or improving habitat for these species?

-- What level of plant and animal diversity should the Forest manage for?

The primary concern about diversity is that the potential for significantly reducing the amount of old growth exists. Old growth is important to many people for reasons ranging from concerns about wildlife, genetics, and scenic quality. Just keeping some of the old growth is important to people as well as protecting future options. The thrust of this issue is how much old growth should be provided and how it should be distributed.

-- Can the Forest meet the assigned Resources Planning Act targets?

The Regional Guide established targets for the Deschutes National Forest of 214 millions of board feet (MMBF) of timber, 36,000 animal unit months (AUM's) of domestic livestock grazing, 2050 thousands of recreation visitor days (MRVD's) of developed recreation, 1930 MRVD's dispersed recreation, and 1275 acres of wildlife habitat improvement. The Forest must determine if it is capable of producing these outputs within acceptable environmental limits.

-- What areas on the Forest should be made available for geothermal leasing and development?

The Deschutes National Forest is considered to have some of the greatest potential for geothermal resources of any area in the Western United States. Approximately 350,000 acres have already been leased. The Newberry Crater is a designated Known Geothermal Resource Area (KGRA). Hot fluids have been located near the surface within the Crater. The interior of the Crater is an important recreation area with two large lakes known for their fishing. Campgrounds and resorts are located adjacent to the lakes. The area is also a popular winter sports area with snowmobiling and cross country skiing. There is an active bald eagle nesting territory within the Crater. Numerous unique geological features are also found within the Crater such as obsidian flows. There are also other areas on the Forest which could be leased that are currently not leased. The main thrust of this issue is where and under what conditions should we lease and how should we protect recreation, visual, wildlife, water quality, and other resource values.

-- How should the Forest manage key roads, particularly those lower standard roads that cross the Cascade Crest?

The Windigo Pass, Waldo Lake, Irish-Taylor, and Todd Lake to Three Creeks Lake roads have been the center of controversy in the past. The primary issues have been whether the roads should be improved to provide additional vehicle use and more direct routes to points west of the Cascades. All of the roads are currently adjacent to Wilderness, the Oregon Cascade Recreation Area, or roadless areas. Improving the roads could affect use levels in the areas. The Windigo Pass and Waldo Lake roads have been considered as possible future highways. Both snowmobilers and cross country skiers are currently using these roads and occasionally conflicts occur.

-- How should the Forest use manmade chemicals for purposes of vegetative manipulation?

Few chemicals are currently used on the Forest. What use that does occur is limited to isolated areas. No large scale programs have been conducted in the past and none are contemplated in the near future. This is treated as an issue because of the high level of concern expressed by the public regarding the potential use of herbicides on Federal lands.

-- How should the Forest manage its lakes, streams, and wetlands to prevent degradation?

The water quality and condition along the shorelines of the lakes and streams on the Forest are good. Riparian conditions are goodwith only isolated problems. Guidelines have been in place and used to protect streamside zones so little damage has occurred. This is an issue only in the sense that it is viewed by many people to be highly important that we continue to provide adequate protection of water quality.

-- To what extent should the Forest enhance or maintain soil productivity and control erosion?

The Forest has few problems with soils. The Forest is flat and has no problems with land or mud slides. The primary problems with the soils resource are associated with compaction or displacement. This issue, much like the water quality issue, is an issue in the sense that soil productivity should be protected or improved when possible.

-- How should the Forest identify and protect its cultural resources?

A large number of scientifically and historically valuable cultural resources are identified on the Forest. Over 50 new sites, mainly comprising prehistoric Indian campsites, are found each year as a result of the Forest's cultural resource inventory program. Cultural sites located in project areas such as timber harvest units or recreation sites are usually protected by designing activities around them, though a few mitigation projects have occurred. Known sites are checked periodically in an attempt to prevent illegal artifact collecting and vandalism which is a serious problem on the Forest. Cultural resources are an issue in the sense that many people, especially local residents, are concerned about how many and how adequately cultural sites are being preserved and protected in the face of all the ground- disturbing projects and cultural resource vandalism that occurs on the Forest.

The analytical elements discussed in Appendix E are as follows:

1. Inventory Data and Collect Information (Planning Step 3)

   The Interdisciplinary Team determined what data were necessary based on the issues and concerns. The analysis of the management situation, formulation of alternatives, and monitoring require data on resource capabilities, existing suppy and demand, expected outputs, benefits, and costs. Existing data were used whenever possible but were supplemented with new data to help resolve sensitive issues or management concerns. Data are on file in the Forest Supervisor's Office.

2. Analysis of the Management Situation (Planning Step 4)

   This analysis examines resource supply and market conditions and determines suitability and feasibility for resolving issues. A land use designation model (FORPLAN) was used to address a number of specific requirements, including benchmarks. Requirements include: (1) the projection of the Forest's current management program; (b) determining the Forest's ability to produce a range of goods and services from the minimum management to maximum production; (c) evaluating the feasibility of reaching the National production goals (RPA targets) and social demands identified as issues and concerns; and (d) identifying monetary benchmarks which estimate the output mix which maximizes present net value (or minimizes the cost) of resources having an established market or assigned value and meeting other departure analysis requirements. The analysis of the management situation AMS document is on file in the Forest Supervisor's Office.

3. Formulation of Alternatives (Planning Step 5)

   The information gathered during the first four planning steps is combined and analyzed to formulate alternative management plans. The alternatives reflect a range of resource management direction. Each major public issue and management concern was addressed in one or more alternatives. Management prescriptions and practices were formulated to represent the most cost efficient way of attaining the objectives for each alternative. Both priced and nonpriced outputs are considered in formulating the alternatives. See Forest Planning Record: Analysis of Management Situation and Alternatives.

## 4. Estimation of Effects of Alternatives (Planning Step 6)

The physical, biological, economic, and social effects of each alternative were estimated and analyzed to determine how each responds to the range of goals and objectives assigned by the RPA program. FORPLAN was used to estimate some of the economic and physical output effects, while other methods were used for remaining effects. The analysis included: (a) direct effects; (b) indirect effects; (c) conflict with other Federal, State, local, and Indian tribe land use plans; (d) other environmental effects; (e) energy requirements and conservation potential; (f) natural or depletable resource requirements and conservation potential; (g) historic and cultural resources; and (h) means of mitigation.

## II. INVENTORY DATA FOR INFORMATION COLLECTION

### A. Forest Data Base

Inventory data was collected for many resources so that Issues could be addressed, limitations defined, and capability determined. Some of the data was necessary to develop the Forest Planning Model and to determine capability and analysis areas.

#### 1. Capability Areas

A Soils Resource Inventory[1] and an Ecoclass Inventory[2] were completed in 1976 for the Deschutes National Forest. The two were done as separate inventories; so, while there was quite a bit of correlation, it was not precise. Since soils are not a serious or complex problem on the Forest, we used the Ecoclass Map as the basis of the Capability Areas. Sixty-eight capability areas were used to describe the Forest and were broken into the following stratification.

Ponderosa Pine
Mixed Conifer
Lodgepole Pine
Mountain Hemlock
Juniper
Sagebrush
Grassland
Water
Rock

#### 2. Analysis Areas

One of the first steps in the development of FORPLAN (Forest Planning Model) was to divide the Forest into analysis areas. For this task, the R2MAP computerized grid mapping system and the TRI (Total Resource Inventory) System 2000 database were used extensively. Analysis areas are tracts of land with relatively homogeneous characteristics in terms of the outputs and effects that are being analyzed within the FORPLAN model. They serve as the basic unit of land in the model for which a range of prescriptions are developed to achieve various multiple use objectives. Their delineations were intended to capture the significant social, biological, and economic differences in the way the land responds to alternative management strategies, and yet keep the model size to a minimum so that it was quicker and less expensive to perform analysis with. Of course, the focus of delineating analysis areas was upon addressing certain issues, concerns, and opportunities identified at the outset of the planning process.

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[1] Daniel H. Larsen, Soil Resource Inventory, Deschutes National Forest, Pacific Northwest Region, 1976.

[2] Leonard A. Volland, PLant Communities of the Central Oregon Pumice Zone, 1976.

The Interdisciplinary Team began developing the FORPLAN model during March 1980. Since then, and as the planning process has evolved, several different analysis area stratifications and model formulations have been explored. The land stratification that was used for this DEIS was settled upon on September 24, 1984. It divided the 1.62 million acres of the Deschutes National Forest into 189 analysis areas. Of these, 155 account for the 1.15 million acres of suitable and available forested land from which FORPLAN can schedule timber harvesting. In general, most analysis areas are larger than 200 acres. The largest is 107,000 acres. They are not often contiguous. The following discussion presents the rationale behind the identification and delineation of the analysis areas according to the six FORPLAN levels of analysis area identifiers.

## Level One

Level One of the analysis area identifiers was used to incorporate some geographic and administrative specificity into the FORPLAN solution. Originally this consisted of 47 geographical locator areas which were intended to help address the issues, concerns, and opportunities, and help ensure the feasible implementation of the Forest Plan. However, this resulted in several times the number of analysis areas that the FORPLAN matrix generator would accept. After several rounds of reconsideration, and since the Forest is not easily divided into natural delineations (i.e., watersheds, roadsheds, etc.), the Team decided to use the four Ranger Districts as the Level One identifiers.

### LEVEL ONE IDENTIFIERS

1. Bend RD
2. Cresent RD
3. Fort Rock RD
4. Sisters RD

While not as geographically detailed as might be desirable, this delineation did prove useful. It provided a better means for constraining the model for spatially feasible solutions than at the Forest level as a whole. It also facilitated communications with Ranger Districts regarding the implications of a FORPLAN solution for their programs. In addition, the costs of doing business for many activities that were modelled in FORPLAN were easily assimulated at the Ranger District level. In some cases there was a need to stratify the economic data in the model by District due to such factors as travel time, soil type, and working group composition differences.

Finally, the District delineation provided a convenient means of stratifying the working group timber yield tables based on a post stratification of the 1971 CFI plot data, and weighted averages of standing volumes and growth potential information. Earlier versions of harvest scheduling models on the Deschutes (i.e., RAM, MUSYC) were based on Forestwide yield table averages despite the wide variation in inventory conditions and growth potentials accross the Forest. Based on earlier FORPLAN runs, these were inadequate for the types of spatial analyses that were being performed in this round of planning. The resulting stratification of the growth and yield tables has resulted in solutions which are more realistic in terms of their scheduled volumes and spatial arrangements.

## Level Two

Level Two of the analysis area stratification identified whether the area was inventoried as being roadless or not. Since Level Three identifies the individual roadless areas, this delineation served merely as a convenience for tracking and controlling activities in the 362,000 acres of wilderness and nonwilderness roadless areas as a whole.

### LEVEL TWO IDENTIFIERS

1. Roaded
2. Roadless

## Level Three

Level Three was used to identify special geographic areas of the Forest that were tied to the planning issues, concerns, and opportunities. Specifically, these included the 230,000 acres of inventoried deer winter ranges, 137,000 acres of individual roadless areas, and 225,000 acres of wilderness areas.

### LEVEL THREE IDENTIFIERS

1. Deer Winter Range
2. Waldo Roadless Area (6106)
3. Charlton Roadless Area (6107)
4. North Paulina Roadless Area (6196)
5. Mt. Jefferson Roadless Area (6198)
6. Bear Wallow Roadless Area (6193)
7. Bend Watershed Roadless Area (6194)
8. West & South Bachelor Roadless Area (6195)
9. Maiden Peak Roadless Area (6108)
10. South Paulina Roadless Area (6197)
11. Metolius Breaks Roadless Area (6191)
12. Oregon Cascade Recreation Area
13. Wilderness

In addition to helping the Team evaluate the outputs and effects on specific tracts of land, these delineations also served as stratifications for yield and cost related data. The winter ranges carry less standing inventory and are generally less productive plant communities. Regeneration is generally more expensive due to the animal damage protection measures that are needed. In addition, thermal cover constraints were applied to timber harvesting in these areas when they were allocated to the Deer Habitat Management Area.

The roadless area delineations indicated areas that would have to incur up front road construction costs before any timber management activities could be scheduled in them. Different roadless areas had different roading costs based on the slope of the terrain involved. Their delineations also facilitated the tracking of scheduled activities in each and every roadless area.

## Working Group Identifiers

The Deschutes National Forest timber inventory is categorized into working groups. Each stand on the Forest is assigned to a working group based on its species composition.

### WORKING GROUP IDENTIFIERS

1. Ponderosa pine
2. Lodgepole pine
3. Mixed conifer
4. Mountain hemlock
5. Meadows, brush, juniper, nonvegetated land

The working group delineation was key to addressing many of the planning issues. Both the mountain pine beetle infestation and the firewood issues are tied to the harvesting of lodgepole pine. The species mix issue is related to the amount of ponderosa pine and other valuable commercial species that are proposed for sale as opposed to lodgepole pine and mountain hemlock whose market values are weaker and more volatile. The working group stratification also better enabled the team to evaluate the effects of alternative harvest schedules on the habitat needs of certain identified indicator species.

In addition, since each working group is composed of different species, each also had its own set of multiple use silvicultural prescriptions, and growth and yield tables. Many of the costs and values used in FORPLAN were stratified according to the working groups. Stumpage values were based on a statistical analysis of the 2400-17 timber sale data, and cut and sold reports. These values were specific to each working group by diameter class. The cost of regeneration, site preparation, timber stand improvement, sale preparation and logging were also tied to the working groups.

However, some of the cost were by neccessity averaged within or across the working groups when it would have been more desirable to have a finer level of economic detail. Regeneration costs are a good example. In some plant communities we have documented success of natural regeneration while in others we have to plant in order to achieve our silvicultural objectives. While we know approximately how many acres of each plant community compose each working group, we don't have the communities mapped so we were not able to use them to spatially locate analysis areas. Therefore, regeneration costs for each working group were based on a weighted average of planting versus natural regeneration.

## Land Class

The Land Class analysis area identifiers were used to categorize the land into the following suitability classifications.

### LAND CLASS IDENTIFIERS

1. Suitable
2. Suitable with Gopher Problems
3. Suitable with 20-80% Rocky Soils
4. Technically and/or Administratively Unsuitable

The suitable classifications were intended to capture significant timber yield and costs differences on forested lands available for scheduled timber harvesting. Of the 1.15 million acres of suitable and available forested lands, 20,000 acres involved stands in which gopher control costs would have to be incurred in order to achieve satisfactory regeneration. An additional 47,000 acres involved rocky soils on which (1) natural regeneration could be achieved only after 15 years, (2) managed stands could not be fully stocked, and (3) additional logging costs would have to be incurred. Because of these additional costs, FORPLAN often decided to not schedule any harvesting on some of these acres if it did not need them to meet the objectives of a particular alternative.

In earlier versions of the Deschutes FORPLAN model, slope was also included as a land class identifier due to its effect on logging costs. Less than two percent of the commercial forest land on the Deschutes prior to the Oregon Wilderness Bill of 1984 was steep enough to require cable logging systems. Most of the Forest could be logged by tractor or FMC. The Oregon Wilderness legislation pulled some of the higher elevation steeper and less valuable lodgepole pine and mountain hemlock stands out of the suitable and available timber base. Many of the remaining cable logging stands were more valuable lower elevation ponderosa pine and mixed conifer. Earlier FORPLAN runs had shown these types of stands to be economically viable. In the interest of keeping the model size down, slope was dropped as an analysis area identifier.

### Existing Condition Class

The sixth and last level of FORPLAN identifiers used to define analysis areas was the existing condition class. This level was used to help describe the current status of both vegetated and nonvegetated lands. It was used primarily to identify which silvicultural options were appropriate to consider on suitable and available forested lands. It was also used to help monitor the effects of alternative harvest schedules on the vegetative successional stages as related to wildlife habitat requirements. Lands which were either not vegetated (i.e., lava, water) or vegetated but with no outputs or effects being tracked in FORPLAN (i.e., brush, juniper) were aggregated into one "catch all" identifier.

#### CONDITION CLASS IDENTIFIERS

1) Regeneration
2) Seeds and saplings
3) Immature Sawtimber
4) Mature Sawtimber
5) Two Storied Stands
6) Meadows, Brush, Juniper, & Nonvegetated Lands

## 3. Production Coefficients

The ID Team developed coefficients for timber, range, wildlife, recreation, water, and costs. Attempts were made to use most of the resource coefficients in the planning model but problems were encountered with model size and reliability of the coefficients. Most of the coefficients other than timber were calculated outside the model but using information from some of the reports from the model.

## 4. Suitable Lands

### Definition of Suitable Lands

NMFA Regulations state that timber production and harvesting may take place only on lands classified as suitable lands. Lands are declared unsuitable if:

-- The land is not forest land as defined in NFMA.

-- Technology is not available to ensure timber production from the land without irreversible resource damage to soils productivity, or watershed conditions.

-- There is not reasonable assurance that such lands can be adequately restocked as provided in NFMA.

-- The land has been withdrawn from timber production by an Act of Congress, the Secretary of Agriculture, or the Chief of the Forest Service.

The Deschutes has lands that are (1) not forested, (2) withdrawn lands, and (3) where regeneration could not be ensured. No lands have been withdrawn because of irreversible resource damage. The process used to identify lands where restoration could not be assured and a table showing the results follow.

The Regeneration Difficulty Screen

Skills

Persons from the Supervisor's Office who were on the Interdisciplinary Team included a Soil Scientist, Timber Planner, and Wildlife Biologist. At the District level expertise was provided by the District Ranger and Foresters, Silviculturists, and Reforestation people.

Step 1 - Soil Resource Inventory (SRI) Maps

The first step was to review and map all soils mapping units which identified a potential problem with reforestation because of droughty or stony soil conditions. The ecoclass maps were also reviewed for Plant Community information which implied difficulty with reforestation. This was all mapped on the SRI soils map which are 1-inch to the mile scale.

Step 2 - Reforestation Techniques

The next step was to identify which reforestation techniques would be considered in making the evaluation. The acceptable and proven techniques included the following:

a. Hand planting
b. Auger planting
c. Machine planting
d. Containerized stock
e. Site preparation - burning, discing, scalping
f. Caging, fencing, tubing
g. Releasing with herbicides
h. Shading

Natural regeneration was also considered but the primary emphasis was placed on planting.

Step 3 - Regeneration Problems

1. The next step was meeting on individual Districts using the positions and expertise previously noted. The procedure was to start with the original map of lands with potential regeneration difficulty and revise it based on more accurate, site specific data and experience or knowledge of the field people. During the reviews, aerial photos, plantation records, more accurate plant community maps (when available), TRI data and general knowledge were used to refine boundaries. A map of the lands considered not suited because of droughty soils developed though this process.

2. With regard to reasonable assurance of regeneration, the question of animal damage also surfaced. Within some plant communities, gophers present serious problems with regeneration. These areas were reviewed using the same expertise involved in the droughty soil conditions. Also consulted was a representative of the U.S. Fish and Wildlife Service who was conducting a research program to determine feasible ways to reforest areas on the Forest susceptible to gopher damage. It was felt that most communiti4es could be regenerated within 5 years by using vexar tubes, planting immediately following harvest and modifying prescriptions some. Some areas where gopher populations were very high were an exception.

3. In October, 1983, the lands classed as not suited because of gopher problems were reevaluated and 4,700 acres were reclassed as suitable. Table B-II-1 summarizes timber suitability. More detailed information is available in the Forest Planning records.[3]

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[3] See Determination of Not-Suited Lands, Deschutes National Forest, 1983.

## DESCHUTES NATIONAL FOREST
## Pacific Northwest Region Standard Format
## for
## Displaying Land Suitability

| | Not Suited for Timber Production | Totals | |
|---|---|---|---|
| I. Total National Forest Area | | | 1,868.2 |
| A. Other Ownerships | 247.8 | | |
| II. Net National Forest Area | | | 1,620.4 |
| A. Water | 36.1 | | |
| B. Nonforest (not stocked with 10% tree cover) | 206.4 | | |
| C. Lands developed for other than timber production purposes (crops, improved pasture, residential, administrative areas, improved roads, power-line clearings). | 10.6 | | |
| III. Forested Lands | | | 1,367.3 |
| A. Withdrawn from scheduled timber production (219.14(a)(4)) | | | |
| 1. Wilderness | 59.5 | | |
| 2. Research Natural Areas | 2.7 | | |
| 3. Other such as (Wild and Scenic Areas, Experimental Forests--Listed by reason). | 10.0 (Exp. Forest)<br>40.9 (Rec. Area) | | |
| Subtotal | 113.1 | | |
| B. Lands growing less than 20 $ft.^3$/ac./yr. | | | |
| 1. Lands classified as unsuitable. | 18.1 | | |
| 2. Lands classified as suitable. | | ( 0 ) | |
| 3. Lands classified as separate suitability component. | | 0 | |

|  |  |  |  |
|---|---|---|---|
| C. Irreversible resource damage (219.14(a)(2)) | 0 |  |  |
| D. Regeneration Difficulty (219.14(a)(3)) | 87.4 |  |  |
| E. Regeneration difficulty lands classified as a separate suitability component. |  | 0 |  |
| IV. Tentatively Suitable Forest Land |  | (a) B2 + E<br>0 | (b) 1,148.7 |
| V. Totals of Suitable and Nonsuitable Lands | 471.7 |  | (a + b) |
| VI. Suitable Land Summary Approved for Forest Planning prior to Regulations of Sept. 30, 1982 and the Chiefs letter of July 15, 1983. | 434.6 |  | 1,184.1 |
| VII. Land Status Under Current TM Plan | 368.5 |  | 1,272.0 |

4. Proposed Land Uses

The condition classes of existing vegetation were used to schedule management activities over time for the various benchmarks and alternatives.

5. Monitoring

At intervals established in the Forest Plan, management practices will be evaluated to determine how well objectives have been met, how accurate efforts and cost projections are, and how closely management standards and guidelines have been applied. The results of monitoring and evaluation may be used to analyze the management situation during review and revision of the Forest Plan in future years.

The Forest Planning data base will provide a means by which changes in resource production rates, differences in inventory data, etc., can be measured and will also be used to monitor implementation activities.

6. Plan Implementation Programs

The data base provides biological and physical data that will help develop subsequent programs for Plan implementation. As more information becomes available, the data base will be updated and improved. This will all be keyed to subparts of the Forest known as "Implementation Units". They will become the backbone for monitoring and implementation as well as data management. Refer to Proposed Forest Plan for more details on implementation.

B. Sources of Data

1. Ecoclass mapping which was done in the mid 70's and identified 55 total ecoclasses of which 41 are forested. Within each ecoclass are plant communities[4] which are described in terms of their capability and production and growth potential. These were used to help define capability areas.

2. The soils on the entire Forest are mapped and classified. Slopes, even though not a problem, were also mapped. This information is available in a publication "Soil Resources Inventory"[5] with accompanying maps.

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[4] Volland, 1976.

[5] Larsen, 1976.

3. The streams and rivers were inventoried and "Stream Side Management Units" identified. These describe the condition of the stream or river and classifies it by its relative importance.

4. In 1978 all of the tree stands which met the definition of forested land were mapped and described. This resulted in over 17,000 stands being delineated. The mapping and descriptions were updated in 1983. This provided much of the information used to identify analysis areas.

5. All of the mule deer winter and transition ranges were mapped and habitat conditions described. Forage condition and thermal cover were measured. This inventory was then correlated with timber stand inventory in 4.

6. Each of the timber stands in 4 were classified into a plant successional stage which when wed up with the Ecoclass map became an inventory of plant diversity.

7. "Wildlife Habitat Relationships for South Central Oregon (USDA Forest Service 1976) was also a source of information and was used in association with Plant Diversity inventory.

8. Timber data regarding existing volumes and growth were based on a 1971 timber inventory with some plots updated in 1978.

9. The Forest's recreation potential was identified through the Recreation Opportunity Spectrum inventory.

10. The visual resources of the Deschutes were inventoried prior to starting the Planning process. It was updated in 1978 and 79.

11. A fueltypes inventory and map were available.

12. General information was available geothermal potential. Limited data is available on the magnitude of it or the economic implications. Get DOGHE Report reference.

13. Information from range analysis and Plant Communities was used to determine areas suitable for livestock grazing and areas which could be used as transitory range.

14. Wetlands, floodplains and riparian areas were inventoried and mapped.

15. Habitat for Bald Eagle and Northern Spotted Owls was mapped and habitat conditions described in general. Bald Eagle habitat has been the focus of some research but the data is not yet available.

16. Land status information was used and continually updated as conditions changed. It included private land, County, Ranger Districts, BLM, and Wilderness.

17. Transportation Planning Areas were available and used to evaluate the implications of Alternatives to transportation efficiency and cost.

18. Economic data was derived from RPA, Regional Direction, or Forest statistics.

19. Information was available on Wild and Scenic Rivers based on an inventory conducted by the Park Service in 1980?.

[1] Plant Communities of the Central Oregon Pumice Zone.

## III. The Forest Planning Model

### A. Overview

Forest Planning is a very complex process in which an enormous amount of information and interdependent decisions must be considered before an alternative management plan can be recommended as the one which best addresses the issues, concerns, and opportunities which were identified at the outset of the planning problem. Because of this, several inter- related computer models and analytical tools have been developed and utilized to help determine the decision space within which alternatives can be developed and to evaluate their associated outputs and effects.

One of these models is called FORPLAN. The name is an acronym for Forest Planning Model. FORPLAN is a computerized linear programming model which has its roots in RAM (Resource Allocation Model) and MUSYC (Multiple-Use Sustained Yield Calculations). It is composed of a matrix generator, a linear programming solution system (FMPS), and a report writer. Within the bounds of the matrix generator and the FMPS solution package, the user is allowed a great deal of latitude in formulating the mathematical representation of the forest planning problem to be analyzed. The Deschutes Planning Team played a large role in debugging and testing the early versions of the FORPLAN software system. Since then, several releases of two different versions of the model have been developed. The bulk of our modelling analysis was performed with Version I, Release 14. The system is maintained and operated on the Univac computer at Fort Collins, Colorado.

The Deschutes FORPLAN Model was specifically designed to help the Interdisciplinary Planning Team analyze the economic and production tradeoffs associated with the recreation, timber, visual, and wildlife resources, and to help evaluate the extent to which various alternative management scenarios were able to address and resolve the identified planning issues. One key step in the development of the FORPLAN Model was to divide the total Forest into "analysis areas". Analysis areas are tracts of land with relatively homogeneous characteristics in terms of the outputs and effects that are being analyzed in the FORPLAN Model. Their delineations were intended to capture the significant social, biological, and economic differences in the way the land responds to alternative management strategies. And, of course, the focus of the delineations was upon the planning issues.

In the FORPLAN model, analysis areas were allocated to management emphases in order to achieve the resource management objectives of a particular benchmark analysis or alternative. "Management emphasis" is a FORPLAN term and is directly related to the "management areas" described in the DEIS. Each management area contains a set of standards and guidelines concerning how the resources in that allocation are to be managed in order to meet the multiple use objectives of that management area. From one to eight different management emphases were available to each analysis area depending upon its resource production opportunities.

In turn, "management prescriptions" were developed to achieve the multiple use objectives of each management area. In FORPLAN these are referred to as combinations of management emphases and intensities. Management prescriptions are combinations of scheduled activities and practices, and their associated outputs and effects. The management prescriptions and their range of timing choices are represented as decision variables in FORPLAN. The outputs and effects associated with the prescription choices are represented as mathematical coefficients in the respective decision variables. FORPLAN had from one to six prescriptions to choose from for each management emphasis for each analysis area. In general, each analysis area contained from one to twenty-one prescription choices. The average was over thirteen.

Which prescriptions FORPLAN selected depended upon the objective function and the set of constraints used to represent a particular benchmark or land management plan alternative. The objective function was usually to maximize present net value or maximize the production of timber. These were subject to first satisfying all the specified constraints. The constraints were designed to guarantee the spatial and temporal feasibility of land allocation and harvest scheduling choices in order to achieve the multiple use objectives of a benchmark or alternative. Once the model had determined that a feasible solution existed by satisfying all of the constraints, it would then search for the set of prescriptions and timing choices which permitted it to optimize the solution according to the specified objective function.

## B. The Analysis Process and Analytical Tools

As directed in the Planning Regulations (36 CFR 219.12(f)(8)):

> "Each alternative shall represent to the extent practicable the most cost efficient combination of management prescriptions examined that can meet the objectives established in the alternative."

The Interdisciplinary Team analyzed economic efficiency at several stages of the planning process in order to be reasonably assured that the alternatives developed and displayed in the DEIS complied with the intent of this direction. The discussion of the analytical process and tools used will follow this general outline:

1) Analysis prior to FORPLAN
2) How FORPLAN was used in the analysis
3) Any analysis done in addition to FORPLAN model analysis

Once the issues, concerns, and opportunities were identified, and the planning criteria were developed, the Interdisciplinary Team began to formulate management areas and their associated standards and guidelines. This step was probably one of the most difficult and laborious, and possibly the most important tasks of the interdisciplinary planning process. Management areas coupled with their respective standards and guidelines provide specific direction for implementation, and serve as a framework for how to use, develop, and protect the Forest's resources in a manner consistent with the goals and objectives of the Plan.

Since the standards and guidelines provide general, rather than site or project specific, direction on how to implement the Forest Plan, there was little opportunity to calculate a present net value or benefit/cost ratio for many of them. However, economic efficiency was a strong consideration throughout their development. For example, from a silvicultural standpoint, clearcutting and planting is more desireable in terms of control over species mix than is natural regeneration. However, natural regeneration is often more cost effective and we have had documented success with it in various plant communities. The standards and guidelines state that natural regeneration will be taken advantage of unless artificial regeneration is necessary.

Another example concerns the determination of which trees are to be left after a regeneration harvest in order to meet the cavity nester habitat needs for snags. Several alternatives were considered including artificial killing. Many options were eliminated either because they did not have documented success, were not pragmatically implementable, or were not cost effective. The resulting snag management plan specifies the number and size of trees that are to be left as future snags in such a way as to have minimum impact on the timber volumes forgone from harvest.

Finally, evidence of the concern for cost efficiency can also be found in the stated goals for the management areas. For example, the goal for Timber Management in the Plan is worded:

> To provide for the optimum production of wood consistent with various resource objectives, environmental constraints, and economic efficiency.

This type of consideration for cost effectiveness was carried throughout the development of the management area standards and guidelines.

Concurrently with the formulation of management areas and the standards and guidelines, the Interdisciplinary Team also began to identify the analysis areas that would be used in the FORPLAN model (See Sect. III.C). For this task, the R2MAP computerized grid mapping system and the Total Resource Inventory (TRI) Systems 2000 (S2K) Forest data base were used extensively to analyze different analysis area combinations that could be used to model and evaluate the production and economic tradeoffs between the recreation, timber, visual, and wildlife resources on the Forest. The objective of this exercise was to delineate the analysis areas in such a way as to capture the important variations in the biological, social, and economic characteristics of the land and yet keep the FORPLAN model size to a minimum so it was quicker and less expensive to run.

Once the final analysis area delineation was settled upon, the next step was to develop the prescriptions for the FORPLAN model. This included the development of timber yield tables (See Sect. III.E), other resource yield coefficients, and the economic costs and benefits (See Sect. IV) associated with each FORPLAN prescription. These prescriptions were designed to enable FORPLAN to analyze the timber related outputs and effects associated with alternative land allocations and multiple use objectives.

To provide FORPLAN with the harvest scheduling flexibility it needed to satisfy the multiple use objectives of each alternative, a wide range of timber yield tables was developed for each management area and working group combination. The development of empirical yield tables was based on statistical T-tests and regression analyses of 1971 CFI plot data. (See Forest Planning Document: Empirical Yield Tables). The managed yield tables were developed with the computer programs "Growth and Yield IV" and "MGYLD5" (Refer to Forest Planning Document: Managed Yield Tables).[2] Professional judgment played an important role in determining the reasonability of the results from the growth and yield predictive models. As the yield tables were developed, they were reviewed by the respective resource specialists to determine if they achieved their intended objectives (i.e., thermal cover, retention foreground, etc.). A soil expectation value was calculated for each. In some cases prescriptions were dropped if another prescription achieved the intended objectives equally as well but had a higher present net value. But for the most part, if FORPLAN had the room and the prescriptions contributed to the range in scheduling choices, they were included in the model so it had the option of whether to use them or not to satisfy its objective function and constraints.

Timber stumpage values and logging costs were based on a statistical analysis of timber sale (2400-17 Forms)[3], Cut and Sold Reports, and some time motion studies for the Pacific Northwest. Costs for reforestation, site preparation, timber stand improvement, sale preparation and other timber management related activities were developed by the Timber Staff and silviculturalists based on recent experiences and anticipated future technology.

The development of recreation output coefficients was based on an analysis of the Forest Recreation Inventory Management (RIM) data base. Capital investment and operation and maintenance costs were based upon recent budgets and use figures along with professional judgment about how recreation consumption patterns would react to alternative levels of capital investment and O&M expenditures.

FORPLAN was used to analyze the production and economic tradeoffs between the recreation, timber, visual, and wildlife resources on the Forest. The model was utilized to analyze the most economically efficient timber related outputs and effects

[1] Forest Planning: Empirical Yield Tables, Deschutes National Forest, R6-DNF 001-85, 1985.

[2] Forest Planning: Managed Yield Tables, Deschutes National Forest, R6-DNF 001-85, 1985.

[3] Cut and Sold Reports, Deschutes National Forest, 1976-1983.

associated with the achievement of the multiple use objectives of an alternative. Which prescriptions FORPLAN selected depended upon the objective function and the set of constraints used to represent a particular benchmark or land management plan alternative. The objective function was usually to maximize present net value or maximize the production of timber. These were subject to first satisfying all the specified constraints. The constraints were designed to guarantee the spatial and temporal feasibility of land allocation and harvest scheduling choices in order to achieve the multiple use objectives of a benchmark or alternative. The following is a list of some of the types of constraints used:

1) constraints on harvest flow, rotation length, and ending inventory;
2) dispersion and wildlife MMR constraints;
3) constraints on the amount of analysis areas available to certain management area prescription sets;
4) rate of harvest constraints in scenic view and intensive recreation allocations;
5) constraints for thermal cover in deer winter range allocations; and
6) other miscellaneous constraints such as accelerated lodgepole pine harvesting, species mix, and budget levels.

Once the model had determined that a feasible solution existed by satisfying all of the constraints, it would then search for the set of prescriptions and timing choices which permitted it to optimize the solution according to the specified objective function.

Several other steps in the analysis process were implemented before the evaluation of a benchmark or alternative were considered complete. The outputs and effects associated with the recreation and range programs for the respective benchmark or alternative were analyized outside of FORPLAN with the use of electronic spreadsheets. During this step, alternative capital investment, and operations and maintenance strategies were examined to determine which resulted in the most efficient prescriptions to meet the objectives of the particular benchmark or alternative.

Another step in the analysis process consisted of loading the FORPLAN solution onto the transportation network model

(Transship) in order to determine the most cost efficient capital investment, and operations and maintenance program, and the associated transportation system needed to move the projected timber and recreation traffic around the Forest.

Next, an electronic spreadsheet was used to determine the total forest budget that would be required to implement each alternative or benchmark. The budget estimates were based on the various resource output levels, capital investment, and operation and maintenance programs that were developed in the previous analysis steps. The budget levels were tracked by resource, appropriated versus allocated funds, and capital investment versus operations and maintenance costs.

Finally, all market plus assigned priced benefits associated with the timber, recreation, range, and special use outputs, and the associated forest budget for the first five decades were entered into a spreadsheet which calulated the total present net value of the particular benchmark or alternative being evaluated.

Which land allocation and resource management investment options resulted in the most economically efficient solution was determined through iterative model and spreadsheet analyses. For example, the Maximum Present Net Value (PNV) Benchmark (market plus assigned values) was arrived at by first examining the solution to the Maximum PNV Benchmark (market values only) and adding the associated recreation and range present net values to it. A per acre PNV analysis indicated that the total Forest PNV could be increased by allocating intensive recreation management areas in the FORPLAN model. These allocations resulted in higher combined timber and recreation discounted values then if they had been managed for timber alone. The other recreation allocations excluded the harvesting of timber and their discounted values were less than if they had been allocated to timber production. FORPLAN was run again with the appropriate intensive recreation allocations added in and the resulting timber PNV was added to the PNV for the recreation and range resources to arrive at the maximum present net value (market plus assigned) for the Forest.

The other Benchmarks were analyzed with FORPLAN through combinations of different objective functions (maximize timber or maximze present net value) and constraints on harvest flow, rotation length, minimum management requirements (MMR's), and discretionary constraints needed to achieve the respective multiple resource objectives. (Refer to Section VI.) Again, the FORPLAN analyses were augmented with a spreadsheet analyses of the recreation and range resource management options.

Once the Benchmark analyses were completed, the Interdisciplinary Team proceeded to evaluate the range of alternatives that were developed to address the issues, concerns, and opportunities. (Refer to Section VII.) Each issue, concern and opportunity was addressed in the alternatives either through land allocations, harvest scheduling, standards and guidelines, or policy statements. Alternatives were modeled through the specification of an objective function and a set of constraints that were necessary to achieve the intent of a particular alternative.

The economic analysis of each alternative with FORPLAN, Transship, and the various spreadsheets were followed up by several other analytical steps before the evaluation of an alternative was considered complete. Three of these additional analytical tools were software programs developed by the Interdisciplinary Team to generate custom reports from the FORPLAN solution. One converted the cubic foot harvest schedule from FORPLAN to board feet by working group and diameter class for five decades. This was used to facilitate communications both internally and externally with people who understand boards better than cubes. Another program interpreted the dynamics of the FORPLAN forest inventory in terms of the seven successional stages by working group for fifteen decades. This better enabled the wildlife biologists to evaluate the effects of the harvest schedule solution on the habitat requirements of certain key indicator species. A third program disaggregated the FORPLAN solution to each of 86 implementation units. Implementation units are contiguous areas of land averaging 19,000 acres in size and are combinations of up to three TRI database compartments. This made it much easier for personnel on the districts to understand the implications of each alternative in terms of where, when, and how they were to implement the alternative if it were selected as the preferred. This also provided a forum for verifying the spatial feasibility of an alternative.

Sometimes the results from any one of these additional analyses indicated the need to do more FORPLAN runs in order to improve upon the overall evaluation of the outputs and effects of a particular alternative. Sometimes the need was apparent to develop another alternative and proceed through the analysis process with it. Once the Team was satisfied with the outputs and effects of the alternatives, their implications with regards to income and jobs in the local economy were analyzed with the IMPLAN input/output model. After all of this was done to satisfaction, the Interdisciplinary Team along with the Forest Management Team and district personnel then evaluated how well each alternative addressed the issues, concerns, and opportunities that were identified at the outset of the planning process. Based on this analysis, a preferred alternative was recommended to the Regional Forester.

## C. Identification of Analysis Areas

One of the first steps in the development of FORPLAN (Forest Planning Model) was to divide the Forest into analysis areas. For this task, the R2MAP computerized grid mapping system and the TRI (Total Resource Inventory) System 2000 database were used extensively. Analysis areas are tracts of land with relatively homogeneous characteristics in terms of the outputs and effects that are being analyzed within the FORPLAN model. They serve as the basic unit of land in the model for which a range of prescriptions are developed to achieve various multiple use objectives. Their delineations were intended to capture the significant social, biological, and economic differences in the way the land responds to alternative management strategies, and yet keep the model size to a minimum so that it was quicker and less expensive to perform analysis with. Of course, the focus of delineating analysis areas was upon addressing certain issues, concerns, and opportunities identified at the outset of the planning process.

The Interdisciplinary Team began developing the FORPLAN model during March 1980. Since then, and as the planning process has evolved, several different analysis area stratifications and model formulations have been explored. The land stratification that was used for this DEIS was settled upon on September 24, 1984. It divided the 1.62 million acres of the Deschutes National Forest into 189 analysis areas. Of these, 155 account for the 1.15 million acres of suitable and available forested land from which FORPLAN can schedule timber harvesting. In general, most analysis areas are larger than 200 acres. The largest is 107,000 acres. They are not often contiguous. The following discussion presents the rationale behind the identification and delineation of the analysis areas according to the six FORPLAN levels of analysis area identifiers.

## Level One

Level One of the analysis area identifiers was used to incorporate some geographic and administrative specificity into the FORPLAN solution. Originally this consisted of 47 geographical locator areas which were intended to help address the issues, concerns, and opportunities, and help ensure the feasible implementation of the Forest Plan. However, this resulted in several times the number of analysis areas that the FORPLAN matrix generator would accept. After several rounds of reconsideration, and since the Forest is not easily divided into natural delineations (i.e., watersheds, roadsheds, etc.), the Team decided to use the four Ranger Districts as the Level One identifiers.

### LEVEL ONE IDENTIFIERS

1. Bend RD
2. Cresent RD
3. Fort Rock RD
4. Sisters RD

While not as geographically detailed as might be desirable, this delineation did prove useful. It provided a better means for constraining the model for spatially feasible solutions than at the Forest level as a whole. It also facilitated communications with Ranger Districts regarding the implications of a FORPLAN solution for their programs. In addition, the costs of doing business for many activities that were modelled in FORPLAN were easily assimulated at the Ranger District level. In some cases there was a need to stratify the economic data in the model by District due to such factors as travel time, soil type, and working group composition differences.

Finally, the District delineation provided a convenient means of stratifying the working group timber yield tables based on a post stratification of the 1971 CFI plot data, and weighted averages of standing volumes and growth potential information. Earlier versions of harvest scheduling models on the Deschutes (i.e., RAM, MUSYC) were based on Forestwide yield table averages despite the wide variation in inventory conditions and growth potentials accross the Forest. Based on earlier FORPLAN runs, these were inadequate for the types of spatial analyses that were being performed in this round of planning. The resulting stratification of the growth and yield tables has resulted in solutions which are more realistic in terms of their scheduled volumes and spatial arrangements.

### Level Two

Level Two of the analysis area stratification identified whether the area was inventoried as being roadless or not. Since Level Three identifies the individual roadless areas, this delineation served merely as a convenience for tracking and controlling activities in the 362,000 acres of wilderness and nonwilderness roadless areas as a whole.

#### LEVEL TWO IDENTIFIERS

1. Roaded
2. Roadless

## Level Three

Level Three was used to identify special geographic areas of the Forest that were tied to the planning issues, concerns, and opportunities. Specifically, these included the 230,000 acres of inventoried deer winter ranges, 137,000 acres of individual roadless areas, 192,506 acres of wilderness areas, and 42,656 acres of Oregon Cascade Recreation Area.

### LEVEL THREE IDENTIFIERS

1. Deer Winter Range
2. Waldo Roadless Area (6106)
3. Charlton Roadless Area (6107)
4. North Paulina Roadless Area (6196)
5. Mt. Jefferson Roadless Area (6198)
6. Bear Wallow Roadless Area (6193)
7. Bend Watershed Roadless Area (6194)
8. West & South Bachelor Roadless Area (6195)
9. Maiden Peak Roadless Area (6108)
10. South Paulina Roadless Area (6197)
11. Metolius Breaks Roadless Area (6191)
12. Oregon Cascade Recreation Area
13. Wilderness

In addition to helping the Team evaluate the outputs and effects on specific tracts of land, these delineations also served as stratifications for yield and cost related data. The winter ranges carry less standing inventory and are generally less productive plant communities. Regeneration is generally more expensive due to the animal damage protection measures that are needed. In addition, thermal cover constraints were applied to timber harvesting in these areas when they were allocated to the Deer Habitat Management Area.

The roadless area delineations indicated areas that would have to incur up front road construction costs before any timber management activities could be scheduled in them. Different roadless areas had different roading costs based on the slope of the terrain involved. Their delineations also facilitated the tracking of scheduled activities in each and every roadless area.

READEX FICHE

## Working Group Identifiers

The Deschutes National Forest timber inventory is categorized into working groups. Each stand on the Forest is assigned to a working group based on its species composition.

### WORKING GROUP IDENTIFIERS

1. Ponderosa pine
2. Lodgepole pine
3. Mixed conifer
4. Mountain hemlock
5. Meadows, brush, juniper, nonvegetated land

The working group delineation was key to addressing many of the planning issues. Both the mountain pine beetle infestation and the firewood issues are tied to the harvesting of lodgepole pine. The species mix issue is related to the amount of ponderosa pine and other valuable commercial species that are proposed for sale as opposed to lodgepole pine and mountain hemlock whose market values are weaker and more volatile. The working group stratification also better enabled the team to evaluate the effects of alternative harvest schedules on the habitat needs of certain identified indicator species.

In addition, since each working group is composed of different species, each also had its own set of multiple use silvicultural prescriptions, and growth and yield tables. Many of the costs and values used in FORPLAN were stratified according to the working groups. Stumpage values were based on a statistical analysis of the 2400-17 timber sale data, and Cut and Sold Reports. These values were specific to each working group by diameter class. The cost of regeneration, site preparation, timber stand improvement, sale preparation and logging were also tied to the working groups.

However, some of the cost were by neccessity averaged within or across the working groups when it would have been more desirable to have a finer level of economic detail. Regeneration costs are a good example. In some plant communities we have documented success of natural regeneration while in others we have to plant in order to achieve our silvicultural objectives. While we know approxiately how many acres of each plant community compose each working group, we don't have the communities mapped so we were not able to use them to spatially locate analysis areas. Therefore, regeneration costs for each working group were based on a weighted average of planting versus natural regeneration.

## Land Class

The Land Class analysis area identifiers were used to categorize the land into the following suitability classifications.

### LAND CLASS IDENTIFIERS

1. Suitable
2. Suitable with Gopher Problems
3. Suitable with 20-80% Rocky Soils
4. Technically and/or Administratively Unsuitable

The suitable classifications were intended to capture significant timber yield and costs differences on forested lands available for scheduled timber harvesting. Of the 1.15 million acres of suitable and available forested lands, 20,000 acres involved stands in which gopher control costs would have to be incurred in order to achieve satisfactory regeneration. An additional 47,000 acres involved rocky soils on which (1) natural regeneration could be achieved only after 15 years, (2) managed stands could not be fully stocked, and (3) additional logging costs would have to be incurred. Because of these additional costs, FORPLAN often decided to not schedule any harvesting on some of these acres if it did not need them to meet the objectives of a particular alternative.

In earlier versions of the Deschutes FORPLAN model, slope was also included as a land class identifier due to its effect on logging costs. Less than two percent of the commercial forest land on the Deschutes prior to the Oregon Wilderness Bill of 1984 was steep enough to require cable logging systems. Most of the Forest could be logged by tractor or FMC. The Oregon Wilderness legislation pulled some of the higher elevation steeper and less valuable lodgepole pine and mountain hemlock stands out of the suitable and available timber base. Many of the remaining cable logging stands were more valuable lower elevation ponderosa pine and mixed conifer. Earlier FORPLAN runs had shown these types of stands to be economically viable. In the interest of keeping the model size down, slope was dropped as an analysis area identifier.

## Existing Condition Class

The sixth and last level of FORPLAN identifiers used to define analysis areas was the existing condition class. This level was used to help describe the current status of both vegetated and nonvegetated lands. It was used primarily to identify which silvicultural options were appropriate to consider on suitable and available forested lands. It was also used to help monitor the effects of alternative harvest schedules on the vegetative successional stages as related to wildlife habitat requirements. Lands which were either not vegetated (i.e., lava, water) or vegetated but with no outputs or effects being tracked in FORPLAN (i.e., brush, juniper) were aggregated into one "catch all" identifier.

### CONDITION CLASS IDENTIFIERS

1) Regeneration
2) Seeds and saplings
3) Immature Sawtimber
4) Mature Sawtimber
5) Two Storied Stands
6) Meadows, Brush, Juniper, & Nonvegetated Lands

## D. Identification of Prescriptions

### 1. Overview

The National Forest Management Act (NFMA) regulations define management prescriptions as "management practices selected and scheduled for application on a specific area to attain multiple use and other goals and objectives" (36 CFR 219.3). Management prescriptions consist of a goal statement which establishes the purpose of the prescription and a compatible set of management practices designed to develop and/or protect some combination of resources, and create or perpetuate a desired condition. Prescriptions were constructed within the requirements specified in 36 CFR 219.27. These requirements guide the development, analysis, approval, implementation, monitoring and evaluation of Forest Plans with regard to:

(a) Resource protection
(b) Vegetative manipulation
(c) Silvicultural practices
(d) Even-aged management
(e) Riparian areas
(f) Soil and water
(g) Diversity

The process of identifying and subsequently developing management prescriptions began with an Interdisciplinary Team review of the issues, concerns, and opportunities (ICO's). Prescriptions were then identified which would help address those ICO's which were related to decisions regarding standards and guidelines, scheduling, or land allocations. There were other ICO's which were to be addressed through policy statements for which it was not appropriate to develop prescriptions.

Standards and guidelines represent the necessary mitigation and resource coordination measures that are required by existing laws, regulations, and policies. Essentially, they provide the guidelines for how prescriptions are to be implemented on the ground. Scheduling and land allocation related ICO's were addressed with the FORPLAN model. For this purpose, coefficients of outputs and effects were constructed for the appropriate management prescriptions. These were then cast in terms of FORPLAN prescriptions. The model was then used to evaluate the implications of alternative scheduling and land allocation choices with regard to addressing the relevant ICO's.

Once the need and purpose for certain types of prescriptions were identified, goal statements for each management prescription were designed to respond to the questions raised by the ICO's. The Interdisciplinary Team then used professional judgment, evaluated existing policy, legislative direction, and research for guidance in developing multiple resource management prescriptions. Table 1 below depicts a summary list of some of the more important research that was consulted for this purpose. The resulting set of prescriptions represents a broad range of resource management emphases, practices, and capital investment levels. General policies, standards, and guidelines were also written by the Interdisciplinary Team to cover practices common to all prescriptions and resource management situations that are Forest-wide in scope.

Table 1 MAJOR RESOURCES USED DURING THE ANALYSIS

Barrett, J.W. Height Growth and Site Index Curves for Managed, Even-Aged Stands of Ponderosa Pine in the Pacific Northwest. USDA, Forest Service. Research Paper, PNW-232., 1978.

Barrett, J.W. Personal Communications, 1984 and 1985.

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In addition to addressing ICO's, the process of designing management prescriptions was also guided by the following criteria: (1) prescriptions should be achievable and contain realistic practices, (2) they are to be general enough to accommodate the variable site specific conditions on the ground, (3) they should be specific enough for the Interdisciplinary Team to develop accurate resource and economic output and effects coefficients, and (4) to the extent practible they should be the most cost effective means of achieving the intent of the prescription.

In order to explore a wide range of alternative ways to manage the forest for its multiple uses, the Interdisciplinary Team identified the capability of each analysis area to produce certain goods and services that were being analyzed within the FORPLAN model. All prescriptions which were related to the production of goods and services capable of being produced from an analysis area were then assigned to it. The assignment criteria focused primarily on the geographical, physical, and biological characteristics of the analysis area as related to its ability to provide different types of recreation, visual, wildlife, and wood outputs. Which prescriptions and schedule of activities the model selected depended upon the multiple use objectives and constraints of the alternative being analyzed.

## 2. Purpose, Criteria, and Assumptions for Prescription Categories

The framework for use, development, and protection of the Forest's resources is provided by the multiple-use standards and guidelines, and the prescriptions for each management area. The standards and guidelines provide direction on how to implement practices common to all prescriptions and resource management situations that are Forestwide in scope. Basically, there are three categories of standards and guidelines. These categories and their respective sets of standards and guidelines are presented below:

(A) Category I--Overall Forest Program

- (1) Human Rights
- (2) Land Adjustments
- (3) Fire & Fuels Management
- (4) Transportation System
- (5) Fuelwood
- (6) Cultural Resources

(B) Category II--Ground Disturbing & Vegetative Management Activities

- (1) Riparian Areas and Fish Habitat
- (2) Soils
- (3) Wildlife
- (4) Threatened, Endangered, & Sensitive Plant Species
- (5) Timber Management

(C) Category III--Specific Forest Uses

- (1) Special Uses
- (2) Energy Resources--Oil, Gas, and Geothermal
- (3) Energy Resources--Newberry Crater KGRA
- (4) Minerals

Prescriptions were developed for each of the fourteen management areas to which different parts of the Forest could be allocated. For each management area, a resource management goal and the general objectives to achieve a desired future condition are described. Management practices are implemented within each prescription according to the resource management goals of the prescription and the standards and guidelines. A map of the land allocation to each management area is available for each alternative. This map in conjunction with the associated prescriptions, and the standards and guidelines identify what activities will take place, where, and when during the implementation of any one alternative. The fourteen management areas are:

1) General Forest
2) Intensive Recreation
3) Undeveloped Recreation
4) Winter Recreation
5) Wilderness
6) Oregon Cascade Recreation Area
7) Scenic Views
8) Deer Habitat
9) Bald Eagle, Spotted Owl, Osprey
10) Old Growth
11) Bend Municipal Watershed
12) Research Natural Areas
13) Special Interest Areas
14) Experimental Forest

Cost efficiency was an overriding consideration for the development of all prescriptions. For example, if a prescription involved timber harvesting, the goal statement for the timber management standard and guideline called for the optimum production of wood consistent with various resource objectives, environmental constraints, and economic efficiency. Therefore, prescriptions were developed with enough implementation flexibility to permit one practice to be selected over another if it proved to be more cost effective in achieving the objectives of the prescription.

Pursuant to the intent of 36 CFR 219.14 (b) and (c), economic efficiency was also considered in the development of the FORPLAN prescriptions for each management area which permitted scheduled timber harvesting. In many cases a wide range of alternative silvicultural regimes was developed and made available to FORPLAN for a particular management area. These represented different schedules of management practices, outputs and effects, and economic consequences. The model could then select which prescriptions most efficiently achieved the objectives of the alternative. In some instances it was neccessary to reduce the number of FORPLAN prescriptions in the model. For this purpose, a soil expectation value was calculated and the prescription with the smallest present net value was dropped. More detail on the development of the timber harvesting prescriptions for each management area is presented in Section III.E of this appendix.

An abbreviated discussion of the prescription categories follows. A more detailed presentation of the management area prescriptions, and the Forestwide standards and guidelines can be found in the Proposed Forest Plan. Additional background information that went into their development is available in the following process documents entitled:

1) Diversity and Old Growth
2) Empirical Yield Tables
3) Managed Yield Tables
4) Range Resource
5) Recreation Resource
6) Spotted Owl Inventory
7) Visual Resource
8) Water Resource
9) Wildlife Resource

The prescriptions will be presented by the the fourteen management area categories. The purpose of specific prescriptions within each category is to provide a realistic range of management intensities to respond to the pertinent issues and concerns, and to prescribe management activities that either are currently, or are anticipated to be, practiced on the Forest.

## a. General Forest Management Area Prescription

### (1) Purpose

Several aspects of the ICO's tie to the production of timber. Timber sold off of National Forest lands is important to the jobs and income of local and regional economies. How much of each species is to be harvested and on what schedule is a concern. How stands are to be managed in the future is also an issue. Tree stand manipulation is also necessary to meet objectives other than timber production. So numerous prescriptions were prepared to represent various intensities of timber manage- ment for the types of timber stands present on the Forest. The selection of prescriptions and the amount of land they applied to resulted in different levels of capital investments, ranges of timber outputs, and different mixes of species harvested.

### (2) Goal Statement

To provide optimum and sustainable levels of timber while providing forage production and opportunities for public use and enjoyment.

### (3) General Theme and Objectives

The primary objective of this management area is to optimize the production of wood fiber through the conversion of unmanaged stands to managed stands. The intent is to utilize to the extent practicable the full potential of the site to grow wood given the multiple-use objectives associated with it.

For this purpose, a wide range of management prescriptions were developed for regenerating, growing, and harvesting stands of timber. A variety of age classes, tree sizes, and stocking levels are currently present on the forest due to past management activities and natural events. In addition, the timber resource on the Forest is composed of a mix of species, the most important of which are ponderosa pine, lodgepole pine, mixed conifers, and mountain hemlock. The prescriptions were developed based upon the unique silvicultural and ecological characteristics of the stands to which they were to apply. Economic efficiency will be used to guide the development and implementation of many of the silvicultural prescriptions.

Forage within this Management Area will be available for use by cattle, sheep, and big game. Some lands have no available forage so there will be no grazing. On other lands there will be need for coordination between timber and range management. On some areas grazing will be an emphasized use. Range structural improvements such as fences and water troughs may be constructed and maintained to meet range and timber management objectives. Range improvement projects such as prescribed burning or seeding may be utilized to improve the forage base.

There are opportunities for dispersed recreation activities, particularly those associated with roads. Informal camping and hunter camps are important uses of the area. Developed site recreation opportunities such as camping or picnicking occur on a limited basis throughout the area.

This Management Area also provides key provides habitat for deer and elk on their summer ranges.

(4) Resource Management Criteria and Assumptions:

(a) Fire Management

Suppression practices will be designed to protect against losses of large acreages to wildfire.

Prescribed fire may be used to protect, maintain, and enhance timber and forage production.

(b) Minerals and Energy Development and Leasing

According to Forestwide Standards and Guidelines.

(c) Pest Management

Monitoring and vegetative management will emphasize prevention of damage or loss due to pests.

(d) Range

Allotments will be managed to achieve or maintain a forage condition rating of fair or better or to the site's capability.

Timber harvesting should accommodate grazing systems when neccessary.

Transitory range will be managed in conjunction with timber management to achieve higher levels of forage production and the desired level of forage utilization.

(e) Recreation

This Management Area will be managed to provide the recreation activity, setting, and experience of the ROS category of Roaded-Natural.

(f) Soils and Water

According to Forestwide Standards and Guidelines.

(g) Special Uses

According to Forestwide Standards and Guidelines.

(h) Timber/Vegetative Management

Timber harvesting will be scheduled in FORPLAN.

Generally, even-aged silviculture will be used.

A wide range of timber management investment options will be provided through applications of natural versus artificial regeneration, timber stand improvements, thinnings, and regeneration practices.

The suitable and available timber resource was divided into ponderosa pine, lodgepole pine, mixed conifer, and mountain hemlock working groups. These, in turn, were stratified within themselves by productivity. Silvicultural prescription options were based on the ecological characteristics of the average plant community compositions for each working group strata.

Regeneration harvest units should not exceed 40 acres in size and have at least one logical harvest between them. Up to 58 percent of an analysis area can be harvested in a decade and still leave a 220 foot leave strip between units.

Stands will generally be available for regeneration harvest after achieving 95 percent CMAI.

Economic efficiency will be a major consideration in the development of silvicultural prescriptions.

(i) Transportation System

Roads constructed within this Management Area will generally be planned to accommodate a larger timber volume than other areas.

(j) Visual

Visual quality will be provided to the extent possible, but without reducing timber outputs. Created openings will be shaped and blended to the natural terrain to the extent practicable when necessary.

(k) Wildlife

In elk and deer summer range a minimum of 25 percent of the area should be maintained in a condition that will provide hiding and/or thermal cover.

Timber harvesting and/or thinning will provide screening between treatment areas and roads with continuous vehicle use.

## b. Intensive Recreation Management Area Prescription

### (1) Purpose

The Deschutes ranks among the top Forests in the Nation for recreation use and opportunity. To a large extent, the local economy is dependent upon outdoor recreation and tourism related expenditures. In addition, outdoor recreation is an integral component of the Central Oregon way of life. Therefore, both developed and dispersed recreation are key ICO's and are also affected by other issues. As such, a prescription was needed which directs the development and management of recreation facilities, resorts, and lodges and prescribes vegetative treatments to provide for higher levels of quality recreation opportunity experiences.

### (2) Goal Statement

To provide a full range of quality outdoor recreation opportunities within a forest environment that can be modified for visitor use and satisfaction or to accommodate large numbers of visitors.

### (3) General Theme and Objectives

This Management Area will provide a wide variety of recreation opportunities including, but not limited to, activities dependent upon developed sites. Sophisticated facilities and sights and sounds of man will be evident and often essential to provide the desired recreation experience. Generally, high concentrations of visitors will occur around developents. Fewer numbers will occur outside developments, but encounters between visitors can be frequent. Visitors with little knowledge of outdoor skills will be able to enjoy the area. Activities will often, but not always, involve a widespread use of motorized vehicles and boats.

### (4) Resource Management Criteria and Assumptions

#### (a) Fire Management

All wildfires should be aggressively controlled using lighthanded methods as much as practical.

Prescribed fire may be used to reduce hazardous fuel concentrations and to form fuel breaks adjacent to high use areas.

(b) Minerals and Energy Development and Leasing

According to Forestwide Standards and Guidelines.

(c) Pest Management

Monitoring and vegetative management will emphasize prevention of damage or loss by pests.

Aggressive suppression techniques should be used to protect the higher valued resources.

(d) Range

Grazing allotments will exclude livestock use from developed sites.

(e) Recreation

This Management area will generally provide recreation setting, activity, and experience opportunities for the ROS categories of Rural and Urban.

(f) Soils and Water

According to Forestwide Standards and Guidelines.

(g) Special Uses

According to Forestwide Standards and Guidelines.

(h) Timber/Vegetative Management

Timber harvesting can be scheduled in FORPLAN. However, much of the harvesting will be done in an unregulated manner outside of FORPLAN.

Timber management should maintain age class diversity, stand vigor, and overall stand condition for recreation purposes.

Timber management should maintain or improve visual quality of scenery associated with the recreational setting.

The amount of an area in harvest created openings should not exceed 14 percent in ponderosa pine, 21 percent in lodgepole pine, 18 percent in mixed conifer, and 20 percent in mountain hemlock.

Rotation ages in general will be long enough to create large trees intermingled with variety of other species and age classes (i.e., 300 years in ponderosa, 110 years in lodgepole, 160 years in mixed conifer).

(i) Transportation System

A wide spectrum of transportation facilities from high standard, double lane roads to Forest local roads and trails can be constructed as needed. Good access for standard passenger and RV-type vehicles will be provided for major attraction and development areas.

(j) Visual

Within existing or future developed areas, facilities and management activities may dominate the landscape. However, the natural environment will be emphasized in appearance. Vegetative management will generally achieve the standards of retention foreground.

(k) Wildlife

Emphasis will be on habitat improvements for watchable wildlife and maintaining or improving fish habitat.

### c. Undeveloped Recreation Management Area Prescription

#### (1) Purpose

The Deschutes ranks among the top Forests in the country for recreation use and opportunity. Both the Central Oregon lifestyle and economy are dependent upon the recreation opportunities offered by the Forest. Areas outside of Wilderness which provide an opportunity for recreating in an undeveloped environment are limited yet there is an increasing demand for it. There is also demand for primitive roads and camping facilities. This prescription was developed to provide that opportunity. Within the prescription are options to permit both motorized and nonmotorized recreational experience.

#### (2) Goal Statement

To provide a range of quality recreation opportunities in an undeveloped forest environment.

#### (3) General Theme and Objectives

This Management Area will provide an environmental setting producing the kinds of recreation experiences that are attainable in large undeveloped areas. It will provide a feeling of vastness and remoteness and will have no irreversible evidence of humans. It will be in a predominately unmodified or natural state. The environmental setting will often include a wide diversification of vegetation, terrain, and visible landform.

It will be managed to provide limited social contact and interaction among visitors. Primitive facilities, such as shelters and small camps, signing, and a transportation system for visitor access and use may be established. Management will provide recreation opportunities that occur in a primitive environment, but restrictions will be less than in Wilderness areas. Motorized activities could be permitted in some areas. Low-standard roads and trails could be utilized for motorized activities.

### (4) Resource Management Criteria and Assumptions

#### (a) Fire Management

Generally, containment, control, and confinement are all acceptable suppression tactics depending on existing and forecasted weather conditions. Normally, low impact suppression methods will be used.

Prescribed burning may be used to meet recreation and wildlife objectives.

#### (b) Minerals and Energy Development and Leasing

According to Forestwide Standards and Guidelines.

#### (c) Pest Management

Monitor pest populations so that early detection of threats to adjacent areas is possible. If adjacent areas are threatened, suppression techniques favoring biological control should be used if available and practical.

#### (d) Range

Outfitter guides using recreation stock will be allowed permits. Grazing of domestic livestock will be permitted to utilize existing forage if the overall characteristics of the area will remain unchanged.

#### (e) Recreation

The area wil be managed to provide the recreation settings, acivities, and experiences for the ROS categories of semiprimitive motorized and semiprimitive non-motorized.

#### (f) Soils and Water

According to Forestwide Standards and Guidelines.

Permits will be allowed for structures if they existed prior to the allocation of lands to this management area.

New structures must blend into the unmodified environment.

Large facilities and transmission corridors are normally not compatible with the objectives of this prescription.

(h) Timber/Vegetative Management

There will be no FORPLAN scheduled timber harvesting.

Unregulated timber harvesting will be permitted in catastrophic situations.

(i) Transportation System

Trails or any roads will be designed, constructed, and maintained to the minimum of standards needed. A limited number of helispots may be constructed.

(j) Visual

Management activities will either be subordinate or not visually evident.

(k) Wildlife

Fish stocking is permitted.

## d. Winter Recreation Management Area Prescription

### (1) Purpose

A need was identified for a prescription to address one of the aspects of the recreation issue, namely winter recreation. Conflicts occur between cross country skiers and snowmobilers. There is also an opportunity to utilize some of the roadless areas for winter recreation if access and trails are available. A prescription was needed which provided for the development of roads and trails and management of hte vegetation to minimize conflicts between users and to enhance the overall winter recreation experience.

### (2) Goal Statement

To provide quality winter recreation opportunities within a forest environment that can be modified for visitor use and satisfaction.

### (3) General Theme and Objectives

This Management Area will provide opportunities for winter recreation activities. Facilities and evidence of man will be present. Roads, vegetation management, and other development activities will be designed and located to enhance the winter recreation opportunities. Social contact will vary but high social contact could be expected in some areas and during some portions of the winter use season. Facilities for tubing and sledding can be developed.

### (4) Resource Management Criteria and Assumptions

#### (a) Fire Management

Suppression practices wil be designed to prevent losses of large acreages to wildfires.

Prescribed fire may be used to remove concentration of material that hinder winter recreation and reduce hazardous fuel loadings.

#### (b) Minerals and Energy Development and Leasing

According to Forestwide Standards and Guidelines.

(c) Pest Management

Take immediate suppression action utilizing principles and techniques that reduce damage and losses and prevent future pest problems.

(d) Range

Allotments in this area will be managed to provide for a forage rating of fair or better. Transitory range that results from vegetative manipulation can be used.

(e) Recreation

The emphasis is to manage the area for winter-type recreational activities. Dispersed recreation use in the summer is compatible but not emphasized.

The area can be zoned to minimize conflicts between motorized and nonmotorized winter uses.

(f) Soils and Water

According to Forestwide Standards and Guidelines.

(g) Special Uses

According to Forestwide Standards and Guidelines.

(h) Timber/Vegetative Management

Timber harvesting will not be scheduled in FORPLAN.

Unregulated timber harvesting will be designed to provide suitable conditions for winter recreation. Clearcuts are permissible to provide openings for snowplay areas

Firewood cutting is permissible.

(i) Transportation System

Local and low standard roads will be located to support the winter recreation activities.

(j) Visual

Vegetation will be managed to create a pleasing variety of views to enhance the winter recreation activity.

(k) Wildlife

According to Forestwide Standards and Guidelines.

## e. Wilderness Management Area Prescription

### (1) Purpose

A general prescription for Wilderness was needed which guided the preparation of Wilderness Plans for each individual Wilderness.

### (2) Goal Statement

To preserve the benefits of Wilderness values for the public, in accordance with the Wilderness Act of 1964.

### (3) General Theme and Objectives

Wilderness areas will provide environments that are:

- Essentially unaltered and undisturbed by humans.
- Primeval in character.
- Places where natural ecological processes (including the natural role of fire) can operate with a minimum of interference by humans.

The Deschutes National Forest manages the eastern portions of the Mt. Jefferson, Mt. Washington, Three Sisters, Mt. Thielsen, and Diamond Peak Wildernesses. Management jurisdiction of the remaining portions of these Wilderness areas is held by the Willamette, Mt. Hood, and Umpqua National Forests.

### (4) Resource Management Criteria and Assumptions

#### (a) Fire Management

Wildfire will be considered an inherent part of all or portions of the general wilderness ecosystem.

Suppression actions may not be neccessary or only require partial implementation in order to meet wilderness management objectives.

#### (b) Minerals and Energy Development and Leasing

The Forest will review valid leasing and mining proposals and make recommendations to the BLM. The Forest may impose reasonable conditions which will not interfere with the mining operation or the statutory rights of the claimant.

(c) Pest Management

Monitor pest populations so that early detection of threats to adjacent areas is possible.

If adjacent areas are threatened, suppression techniques favoring biological control should be used if available and practical.

(d) Range

Domestic livestock grazing, other than for recreation purposes, will be permitted in those areas where grazing had been established prior to the area's Wilderness designation.

(e) Recreation

Recreation is an appropriate use of Wilderness areas to the extent that it does not degrade values for which the Wilderness was established.

Wilderness will be managed to provide the setting, activities, and experiences for the ROS categories of Primitive and Semiprimitive Nonmotorized.

(f) Soils and Water

Naturally occurring erosion processes will be allowed to continue unless they intolerably impact other Wilderness resources or resources outside the Wilderness.

Wilderness use which is accelerating loss of surface soils and degrading water quality will be controlled or eliminated.

(g) Special Uses

Commercial special use permits can be issued for outfitter guide type activities, but will be managed to meet the objectives of Wilderness management.

(h) Timber/Vegetative Management

These areas will not be managed for commercial timber production.

(i) Transportation System

Roads are not permitted. Existing roads will be restored to natural conditions.

(j) Visual

Visual quality will be preserved in a natural setting.

(k) Wildlife

Traditional and current fish stocking may continue.

Emphasis will be placed on maintaining native species with particular emphasis on the habitat requirements of threatened and endangered species.

### f. Oregon Cascade Recreation Area Prescription

#### (1) Purpose

The Oregon Wilderness Act of 1984 created the Oregon Cascade Recreation Area. A prescription was needed which would provide guidance concerning how the area should be managed to achieve its legal mandate. Within the context of the prescription, several different strategies needed to be considered regarding the level of development and to determine where motorized use could occur. Strategies were also needed regarding how to manipulate vegetation to enhance recreation, improve wildlife habitat, and salvage dead and dying lodgepole pine.

#### (2) Goal Statement

To conserve, protect, and manage, in a substantially unmodified condition, areas for their unique character and values according to the Oregon Wilderness Act of 1984.

#### (3) General Theme and Objectives

This Management Area will provide an environmental setting producing the kinds of recreation experiences that are attainable in large undeveloped areas. It will provide a feeling of vastness and remoteness and will have no irreversible evidence of man. It will be in a predominantly unmodified or natural state. The environmental setting includes a wide diversification of vegetation, terrain, and visible landforms.

It will be managed to provide limited social contact and interaction among visitors. Primitive facilities, such as shelters and small camps, signing, and a transportation system for visitor access and use may be established. Management will provide recreation opportunities that occur in a primitive environment, but restrictions will be less than in Wilderness areas. Motorized activities could be permitted in some areas. Roads and trails could be utilized for motorized activities.

(4) Resource Management Criteria and Assumptions

(a) Fire Management

Generally, containment, control, and confinement are all acceptable suppression tactics, depending on the forecasted weather conditions. Normally, low impact suppression methods and natural barriers will be used.

Prescribed fire may be used to meet recreation and wildlife objectives.

(b) Minerals and Energy Development and Leasing

The area will be withdrawn from entry or leasing on January 1, 1989.

(c) Pest Management

Monitor pest populations so that early detection is possible. If adjacent areas are threatened, suppression techniques favoring biological control should be used if available.

(d) Range

Grazing of domestic stock will be permitted to utilize excess forage not needed to meet wildlife objectives. Livestock will be managed to minimize conflicts with recreationists.

(e) Recreation

The Recreation Area is zoned for the ROS Category of Semiprimitive Motorized and Semiprimitive Nonmotorized use.

Primitive facilities, constructed of native materials, may be installed to protect resources, provide for safety, and distribute recreation use.

Use of motorized vehicles will be restricted to designated roads and trails. Snowmobiling will be allowed when the depth of continuous snow- cover is adequate to protect other resources from adverse impacts.

(f) Soils and Water

According to Forestwide Standards and Guidelines.

(g) Special Uses

New permits for small devices and structures may be allowed where necessary for resource protection and management or visitor safety and comfort. Transmission corridors are not compatible with the objectives of this area.

(h) Timber/Vegetative Management

There will be no scheduled harvest in FORPLAN. Unregulated timber harvesting will be permitted in catrastrophic situations such as fire or insect salvage. Restoration of such an area will be designed to return it to a natural state.

Timber harvesting can be used to manipulate vegetation for wildlife habitat improvement and enhance recreation opportunities.

Commercial or personal use fuelwood gathering will not be permitted.

(i) Transportation System

Trails and roads will be designed, constructed, and maintained to the minimum standard needed to achieve the goals of the Recreation Area.

A limited number of helispots may be constructed where natural openings are available.

(j) Visual

Management activities will either be subordinate to the surrounding area or not visually evident.

(k) Wildlife

Wildlife habitat improvement should be designed to enhance the recreation experience. Created small openings, use of salt, blinds, or interpretive trails are acceptable. Fish stocking and fish habitat improvement is permissible.

## g. Scenic Views Management Area Prescription

### (1) Purpose

Due to the importance of recreation and visual quality in general on the Deschutes, maintaining or enhancing visual quality is a key issue. A series of prescriptions were needed to direct management depending on whether the area was viewed by a lot of people from very close or fewer people from farther away. A wide range of silvicultural prescription options were also needed since tree stands can be managed to improve their appearance and open up vistas of meadows and peaks.

### (2) Goal Statement

To provide Forest visitors with visually appealing scenery.

### (3) General Theme and Objectives

Landscapes seen from selected travel routes and use areas will be managed to maintain or enhance their appearance. To the casual observer, results of activities either will not be evident or will be visually subordinate to the natural landscape.

Timber stands, which have remained unmanaged in the past because of their visual sensitivity, will begin receiving treatment to avoid loss of the stand to natural causes. Landscapes containing negative visual elements, such as skid roads, activity residue, or cable corridors, will be rehabilitated. Landscapes will be enhanced by opening views to distant peaks, unique rock forms, unusual vegetation, or other features of interest.

The desired condition for ponderosa pine is to achieve and maintain visual diversity through variations of stand densities and size classes. Large, old-growth pine will remain an important constituent, with individual specimen trees achieving 30 inches in diameter and having deeply furrowed, yellowbark characteristics.

For other species, the desired condition requires obtaining visual variety through either spatial distribution of age classes and species mixes, through density manipulation, or through a mixture of age classes within a stand.

(4) Resource Management Criteria and Assumptions

(a) Fire Management

Suppression efforts in the immediate foreground should utilize low impact methods. In middleground and background areas, fires can be suppressed using standard techniques.

Low intensity fires should not exceed 300 acres per occurence and should have no long lasting impacts on the visual resource.

Prescribed fire is acceptable.

Fuel treatments in foreground areas should be planned and timed to avoid being highly visible. In middleground and background areas, fuels may be treated using standard techniques.

In foreground areas slash should be cleaned up to a higher standard than in the middleground and background.

(b) Minerals and Energy Development and Leasing

According to Forestwide Standards and Guidelines.

(c) Pest Management

Monitoring and vegetative management will emphasize prevention of damage by pests.

Suppression action will be taken immediately utilizing methods which will provide for the long-term protection of the visual resource.

(d) Range

Livestock grazing will be allowed. Grazing may be encouraged to complement and add to the scenic variety.

(e) Recreation

This Management Area will provide the setting and experience opportunities of the ROS category of Roaded-Natural.

(f) Soils and Water

According to Forestwide Standards and Guidelines.

(g) Special Uses

Utilities and electronic sites may be located in these areas if the facilities and associated improvements are located, designed, and maintained so as to meet the Visual Quality Objectives.

(h) Timber/Vegetative Management

Even-aged management will be applied to small units to achieve diversity in adjacent stands of different ages. Uneven-aged management or group selection may be used on a case-by-case basis.

A stand should not be treated until adjacent stands which were harvested are no longer considered an opening. Stands are considered an opening until trees are at least 10 feet tall on slopes less than 30 percent and 15 feet tall on slopes greater than 30 percent.

In retention foreground areas, no more than 14 to 21 percent of a seen area can be in harvest created openings at any one time depending on the working group. In partial retention foreground areas, the percents range from 23 to 26 percent depending on the working group. In middleground, up to 13 percent of an area can be in harvest created openings regardless of the working group.

Rotation lengths vary by the working group and the Visual Quality Objective. In retention foreground, ponderosa pine and mixed conifer stands are held well beyond culmination, 285 years and 160 years respectively. In partial retention foreground, ponderosa is held for 160 years and mixed conifer is held for 140 years. In these areas, both lodgepole and mountain hemlock are allowed to be harvested at culmination ages, or 95 percent thereof.

(i) Transportation System

New roads and trails will be located and designed to meet adopted Visual Quality Objectives for the area.

(j) Visual

In retention, the results of activities may not be visually evident.

In partial retention, the results of activities may be visually evident, but remain visually subordinate to the characteristic landscape.

(k) Wildlife

Emphasis will be on habitat improvement for watchable wildlife. Consideration should be given to minimizing the risks of vehicle-deer collisions when managing stands along major highways through deer migration corridors

### h. Deer Habitat Management Area Prescription

#### (1) Purpose

Deer habitat and population levels are an important component of the issues. Prescriptions were needed to provide optimum deer winter range conditions on appropriate portions of the Forest. Thermal cover and foraging areas are important elements of the deer winter range habitat. Prescriptions were necessary which grew trees and resulted in different quality and amounts of thermal cover. It is also necessary to schedule timber harvesting in such a way as to create an appropriate mosaic of forage and cover areas. Much of the bitterbrush community is old and decadent, and of little forage value. It is necessary to implement a prescribed burning program to improve the forage values in these areas.

(2) Goal Statement: To manage vegetation to provide optimum habitat conditions on deer transition ranges while providing for domestic livestock forage and wood products.

(3) General Theme and Objectives: Vegetation will be managed to provide optimum habitat. Herbaceous vegetation will be managed to provide a vigorous forage base with a variety of forage species available. Forage conditions will be improved where conditions are poor. Foraging areas will be created where forage is lacking. Cover will be developed where lacking, maintained when in proper balance, or reduced when overabundant and more foraging areas are needed.

Livestock grazing, both sheep and cattle, will be permitted with associated range improvements such as fences and water developments.

#### (4) Resource Management Criteria and Assumptions

##### (a) Fire Management

High intensity burns can help to maintain diversity. Maximum high intensity burn acre objectives for the area are 1 percent and 500 acres per occurrence.

The prescribed use of fire will be necessary to maintain diversity within the plant communities. Burning prescriptions should provide for the reestablishment of bitterbrush within 20 years. Approximately 2.5 percent of the Management Area could be burned over annually.

(b) Minerals and Energy Development and Leasing

According to Forestwide Standards and Guidelines.

(c) Pest Management

Suppression action should be taken when pests are adversely affecting forage production or cover.

(d) Range

Forage utilization by livestock will be maintained at a level so that sufficient forage is available to support the desired number of deer.

Grazing systems will be compatible with or complementary to the habitat objectives for deer.

(e) Recreation

The area will provide various dispersed recreation opportunities primarily for the activities of viewing wildlife, hunting, gathering forest products, and roaded camping. This will be consistent with the ROS category of Roaded-Natural.

(f) Soils and Water

According to Forestwide Standards and Guidelines.

(g) Special Uses

Special uses which do not have constant human activities will be acceptable.

(h) Timber/Vegetative Management

Timber management activities will be applied to meet the wildlife habitat objectives. Timber harvesting will be scheduled in such a way as to maintain an approximate 40/60 cover to forage ratio throughout time.

On suitable lands, even-aged silvicultural systems will be the norm and will include precommercial and commercial thinnings.

In ponderosa pine suited lands, stands will generally be available for harvest at 95 percent CMAI, although shorter rotations are permissible to help meet the forage/cover objectives. Stocking levels will be based on site-specific conditions. A crown closure greater than 40 percent with trees 30 feet high is recommended for thermal cover. Prescribed burning is recommended for site preparation where soil conditions and fuels permit.

Due to the mountain pine beetle epidemic, the stands in lodgepole pine suited lands are to be converted in 10 to 20 years while maintaining 25 percent of an area in cover. The cover requirements should be based on areas of 4,000 to 10,000 acres.

In unsuitable ponderosa pine, the objective is to produce cover. Regeneration is primarily by shelterwoods. Some slash will be left to protect the site and provide shade for the seedlings. No commercial thinnings will occur.

(i) Transportation System

Unneeded roads will be obliterated. Local roads may be closed on a seasonal basis in coordination with the Oregon Department of Fish and Wildlife.

(j) Visual

Along major roads, wildlife habitat improvement projects should be located, shaped, and timed to reduce adverse visual impacts.

(k) Wildlife

Habitat should be managed to provide for an average of 40 percent thermal and hiding cover through time.

Maintain or improve forage conditions with an emphasis on increasing the variety of plants available for forage and a mixture of age classes of shrubs.

Foraging areas created through timber harvesting should be irregularly shaped and no more than 600 feet from cover from any point. Maintain thermal cover immediately adjacent to foraging areas.

## i. Bald Eagle, Spotted Owl, Osprey Management Area Prescription

### (1) Purpose

Bald Eagles, Spotted Owls and Ospreys are the subject of issues because the Eagle is listed as a threatened species, the Owl as a sensitive species and the osprey has specialized habitat requirements. Prescriptions were needed which would provide habitat for these species in perpetuity.

### (2) Goal Statement

To protect and manage habitat to provide for the perpetuation of bald eagles, northern spotted owls, and osprey, while providing wood outputs.

### (3) General Theme and Objectives

Habitat will be managed for bald eagles, northern spotted owls, and osprey. Nesting habitat and foraging areas will be protected and enhanced. Suitable nesting sites will be provided on a continuing basis. Old-growth stands with large trees will be emphasized for bald eagles and northern spotted owls. Osprey habitat will contain numerous trees and snags suitable for nesting. Stands will be managed so that suitable nesting sites are available on a continuing basis and spaced to minimize territorial competition. Human disturbance will be minimal during the nesting season.

### (4) Resource Management Criteria and Assumptions

#### (a) Fire Management

Ospreys:

Protection of nest trees and adjacent perch trees is the highest priority.

Maximum low intensity burn acre objectives are 10 acres per year and 5 acres per occurrence.

High intensity fires should be aggressively controlled. Maximum high intensity burn acre objectives are 1 acre per year and 1 acre per occurrence.

Prescribed fire will not normally benefit this resource.

Bald Eagles:

Protection of nest trees and adjacent trees will be the highest priority in this area.

Low intensity fires outside the nesting season do not conflict with the habitat objectives. Maximum low intensity burn acre objectives are 10 acres per year and 1 acre per occurrence. Maximum high intensity burn acre objectives are 5 acres per year and 1 acre per occurrence.

The use of prescribed fire will be appropriate in ponderosa pine stands, but not working groups.

Northern Spotted Owls:

Maximum annual low intensity burn acre objectives for each area are 1 percent.

Maximum high intensity burn acre objectives for each area are .3 percent.

Prescribed burning may be used to treat slash.

(b) Minerals and Energy Development and Leasing

According to Forestwide Standards and Guidelines.

(c) Pest Management

Suppress forest pests when they are adversely affecting that component of the vegetation which is essential for nesting and rearing habitat.

(d) Range

Range management practices can be programmed and planned in these areas.

(e) Recreation

These areas will be managed to provide dispersed recreation opportunities such as hiking, bird watching, and hunting that are compatible with maintaining desired populations of these wildlife species. The appropriate ROS categories are Semiprimitive Nonmotorized, Semiprimitive Motorized, or Roaded-Natural.

(f) Soils and Water

During extended and severe drought the U.S.F.S. will work closely with the Water Master to maintain minimum pool levels in Crane Prairie and Wickiup Reservoirs which are important nesting and food sources for bald eagles and spotted owls.

(g) Special Uses

According to Forestwide Standards and Guidelines.

(h) Timber/Vegetative Management

Ospreys:

Even-aged silviculture can be applied with inclusions of small areas where two to four dominant trees per acre are left. However, small group selection may be used as an alternate where stand conditions, topography, or other factors indicate 5 to 10 large trees per acre need to be left.

In general, stands can be available for regeneration harvest at CMAI or 95 percent thereof.

Bald Eagles:

Emphasis will be on managing ponderosa pine and Douglas-fir.

Small group selection even-aged management will be applied to produce an average of eight trees per acre that are 300 to 350 years old with open crowns and large limbs. A maximum of 3.8 percent of the area can be scheduled for harvest in each decade.

Northern Spotted Owls:

Management should be directed to developing a two or three storied stand containing 8 to 10 old growth trees per acre.

Rotation ages will be approximately 350 years. Regeneration units should range in size from 2 to 5 acres. A maximum of 3.8 percent of the area can be scheduled for regeneration harvest per decade.

(i) Transportation System

Road networks will be designed to facilitate easy control of access during the nesting season. Road closures can be used to limit disturbing human activity.

High voltage electric lines are not acceptable unless specifically designed to prevent electrocution of large birds.

(j) Visual

Artificial osprey nesting structures must blend into the surrounding area.

Regeneration units will be arranged to provide long term habitat requirements and minimize adverse impacts on the visual resource.

(k) Wildlife

Osprey:

Protect all existing nest site and associated perch trees.

Manage the timber to provide for some trees with dead and dying tops.

With many nest sites being lost to natural causes, an artificial nesting structure program may be required.

Bald Eagles:

Protect all existing nesting, roost, and perch trees.

Trees on the average should exceed 110 feet in height and be 20 inches or greater dbh.

### Northern Spotted Owls:

A 1,200 acre area per nesting pair will be managed to provide suitable nesting habitat.

The area should be characterized by mature and overmature tree stands with a fairly dense understory.

### j. Old Growth Management Area Prescription

#### (1) Purpose

Old growth is an issue which centers around how much and where it is distributed. Some of the other prescriptions, such as those for undeveloped recreation and spotted owls, contribute to the old growth resource. If the amount and distribution of old growth resulting from these prescriptions was not adequate, then an old growth prescription was needed to fill in the holes.

#### (2) Goal Statement

To provide old-growth tree stands for (1) preservation of natural genetic pools, (2) habitat for plants and wildlife species associated with overmature tree stands, and (3) contributions to the diversity spectrum.

#### (3) General Theme and Objectives

Vegetation will be managed to provide mature or overmature tree stands having large trees, snags, dead downed material, and in many cases, two or more canopy levels. Such stands would vary in size and be located so that a wide variety of plant communities and conditions are represented. Other Management Areas will also provide old growth.

#### (4) Resource Management Criteria and Assumptions

##### (a) Fire Management

In mountain hemlock, mixed conifer, and lodgepole pine, aggressive suppression will be emphasized.

In ponderosa pine, low intensity fires may be appropriate. High intensity fires will be suppressed.

Prescribed fire is not appropriate except for ponderosa pine where it may be used to maintain species and abundance of plants which would occur with fire as part of the ecosystem.

(b) Minerals and Energy Development and Leasing

According to Forestwide Standards and Guidelines.

(c) Pest Management

Utilize sound pest management principles while recognizing that some level of pest activity is associated with old-growth systems. Retain as much of the old-growth character as possible during suppression.

(d) Range

Livestock grazing is permitted at levels which maintain the desired composition associated with old growth.

Forage utilization will be limited to that needed to maintain indigenous plant and animal species. Exotic plants cannot be introduced.

(e) Recreation

Developed recreation is not compatible. Off- road vehicles are not permitted.

This Management Area generally provides recreation opportunities for the ROS categories of Semiprimitive Nonmotorized, Semiprimitive Motorized, or Roaded-Natural.

(f) Soils and Water

According to Forestwide Standards and Guidelines.

(g) Special Uses

According to Forestwide Standards and Guidelines.

(h) Timber/Vegetative Management

The timber resource is managed to retain the old growth characteristics and prolong the life of the stand.

Timber harvesting is not scheduled in FORPLAN. However, timber may be harvested to meet old growth objectives.

(i) Transportation System

Road and trail access will be limited to minimum-standard, intermittent use roads, or temporary roads.

(j) Visual

This prescription will not significantly impact the visual quality. Any timber harvesting will be arranged and shaped to mitigate visual impacts.

(k) Wildlife

Emphasis on habitat conditions wil be to provide: (1) large trees, (2) standing and down dead trees, and (3) in appropriate plant communities, vertical structure within stands.

## k. Bend Municipal Watershed Management Area Prescription

### (1) Purpose

The City of Bend and nearby areas depend on the Bend Watershed for abundant high quality water. A prescription was needed for the Bend Municipal Watershed which would protect and enhance the continued flow of water for this resource. Vegetative management is necessary to prevent a dangerous build up of fuels or insect epidemics.

### (2) Goal Statement

To provide water at a level of quantity and quality which will, with adequate treatment, result in a satisfactory and safe domestic water supply.

### (3) General Theme and Objectives

The Bend Municipal Watershed will be managed to provide healthy timber stands that are growing at a moderate rate. Stands will be in a condition which provides a minimum threat for catastrophic fire and which will retard insect infestation. Existing water quality will be maintained. Stream channels will be in stable conditions throughout the watershed. Access into the watershed for administrative and dispersed recreational activities will be allowed at a level which is compatible with the water quality goals of the Management Area.

### (4) Resource Management Criteria and Assumptions

#### (a) Fire Management

Fire protection will be a high priority. Fires within or which threaten the watershed will be aggressively controlled and mopped up.

An aggressive low intensity prescribed fire program will be necessary in portions of the watershed to treat natural fuels accumulation.

The watershed will be given high priority for fuel treatment (in addition to prescribed burning) to keep fuel loadings at levels which will minimize the risk of catastrophic fires.

(b) Minerals and Energy Development and Leasing

According to Forestwide Standards and Guidelines.

(c) Pest Management

The emphasis will be to minimize conditions which are conducive to disease or insect attack. In the event of increased insect or disease occurences within this area, high priority will be given to treatment of the affected stands.

(d) Range

No grazing by domestic livestock will be allowed.

(e) Recreation

The area will be managed to provide recreation opportunities for the ROS category of Semiprimitive Nonmotorized.

(f) Soils and Water

Where feasible, channels with poor stablity characteristics will be treated either structurally or vegetatively in order to stabilize them and enhance water quality.

Debris jams will be removed where this will prevent loss of bank or channel stability.

(g) Special Uses

According to Forestwide Standards and Guidelines.

(h) Timber/Vegetative Management

Timber harvesting will not be scheduled in FORPLAN. However, timber may be harvested (1) in the event of a catastrophe, (2) to reduce fuel levels, and (3) to create vigorous stands which contribute to the overall health and stability of the watershed.

(i) Transportation System

Helispots will be strategically located and constructed to provide rapid access in the event of fire.

Any new roads or trails constructed will be located, designed, and maintained to protect water quality. It may be necessary to close some roads to the public.

When timber is harvested, specialized logging equipment which results in a minimum of ground disturbance will be used.

(j) Visual

Management activities will either be subordinate to the surrounding landscape, or visually not evident.

(k) Wildlife

According to Forestwide Standards and Guidelines.

## 1. Research Natural Area Management Area Prescription

### (1) Purpose

There are two established Research Natural Areas on the Forest and seven new areas needed to fullfil some cell requirements as identified for the Research Natural Area Program.[1] Prescriptions were needed so these areas could be protected, if selected in an alternative.

### (2) Goal Statement

To preserve examples of naturally occurring ecosystems in an unmodified condition for research and education.

### (3) General Theme and Objectives

In Research Natural Areas (RNA's) natural features are preserved for scientific purposes and natural processes are allowed to dominate. The main purposes of Research Natural Areas are to provide:

- -- Baseline areas against which effects of human activities can be measured.
- -- Sites for study of natural processes in undisturbed ecosystems.
- -- Gene pool preserves for all types of organisms.

Forest-type RNA's will preferably be old-growth or virgin stands and offer the best available site or growing conditions for a given tree species. When old-growth stands or optimum sites are not available, younger age classes or less productive sites may be an acceptable substitute. Nonforested type RNA's will be sites with good to excellent range conditions.

[1] C. T. Dyrness Et.al. Research Natural Area Needs in the Pacific Northwest. USDA, Forest Service, General Technical Report, PNW 38. 1975.

(4) Resource Management Criteria and Assumptions:

(a) Fire Management

Unless plans approved by the Chief provide for letting natural fires burn, aggressive containment using low impact methods should be used.

Prescribed fire will be used only in conjunction with approved research projects.

(b) Minerals and Energy Development and Leasing

Research Natural Areas will be recommended for withdrawal from mineral entry. Mineral leasing will be denied or done through "no surface occupancy".

(c) Pest Management

Reintroduction of fire should be considered to reduce possible insect epidemic conditions.

Suppression action should be taken when the damage has the potential to modify ecological processes to the point that the area has little value for observation and research.

(d) Range

Grazing will only be allowed when the Regional Forester and Director of the Pacific Northwest Forest and Range Experiment Station authorize such a practice to preserve some representation of the vegetation for which the natural area was originally created.

(e) Recreation

No physical improvements for recreation purposes will be permitted.

These areas will be closed to all off-road vehicles.

Recreation uses will be allowed as long as they do not modify the area to the extent that such uses threaten impairment of research and educational values. The relevant ROS categories are Semiprimitive Nonmotorized, Semiprimitive Motorized, and Roaded-Natural.

(f) Soils and Water

According to Forestwide Standards and Guidelines.

(g) Special Uses

According to Forestwide Standards and Guidelines.

(h) Timber/Vegetative Management

Timber harvesting is not allowed in a Research Natural Area. No control for insect and disease should be instituted.

(i) Transportation System

No roads or trails should be permitted at the boundaries or within these areas, except those considered essential to research or educational uses.

(j) Visual

Research facilities installed within the areas will blend with the natural surroundings.

(k) Wildlife

According to Forestwide Standards and Guidelines.

## m. Special Interest Area Management Area Prescriptions

### (1) Purpose

The Forest has numerous geogical and botanical features that are unique and contribute to the wide range of recreation opportunities found on the Forest. Several different types of Special Interest Areas exist. Some have been designated by the Secretary of Agriculture while others are administratively designated. Prescriptions were needed to protect, enhance, and interpret the areas.

### (2) Goal Statement

To preserve and provide interpretations of unique geological, biological, zoological, and cultural areas for education, scientific, and public enjoyment purposes.

### (3) General Theme and Objectives

Unusual geological or biological sites and areas are preserved and managed for education, research, and to protect their unique character. Facilities and opportunities may be provided for public interpretation and enjoyment of the unique values of these sites and areas. The primary benefiting uses of these areas will be for developed and dispersed recreation, research, and educational opportunities. These areas will be designated by Regional Forester authority.

### (4) Resource Management Criteria and Assumptions

#### (a) Fire Management

All suppression entries should use lighthanded, low impact methods.

Prescribed fire may be used to attain the desired characteristics of the area and reduce fuels to their natural conditions.

#### (b) Minerals and Energy Development and Leasing

According to Forestwide Standards and Guidelines.

(c) Pest Management

Take immediate suppression action utilizing techniques which protect and prevent future pest outbreaks.

(d) Range

Domestic livestock will be permitted to utilize the existing forage without changing the overall natural characteristics or conflicting with the purpose of the area.

(e) Recreation

Facilities may be provided for protection of the resource values, visitor use, environmental interpretation, or safety of visitors.

These areas will provide the recreation setting and experience opportunities for the ROS categories of Roaded-Natural or Rural.

(f) Soils and Water

According to Forestwide Standards and Guidelines.

(g) Special Uses

According to Forestwide Standards and Guidelines.

(h) Timber/Vegetative Management

Timber harvesting will not be scheduled in FORPLAN. However, timber harvesting and vegetative management will be allowed in catastrophic situations and when necessary to meet the objectives of the area.

(i) Transportation System

Trails can be provided. Road density will be low.

(j) Visual

Management activities viewed from the roads and trails may be visible, but subordinate to the surrounding landscape.

### (k) Wildlife

Manipulation of the game and fish habitat will be allowed as long as it maintains a natural appearance and does not conflict with the purpose or objective of the area.

### n. Experimental Forest Management Area Prescription

#### (1) Purpose

The Forest has one Experimental Forest for which the primary purpose is research. A prescription was needed for the area which did not deter the research thrust but did incorporate some other resource objectives and broadened the base for research projects.

#### (2) Goal Statement

To provide an area where field research activities can be conducted while considering other resource values.

#### (3) General Theme and Objectives

The Pringle Falls Experimental Forest is within the Forest boundary and is administered by the Pacific Northwest Forest and Range Experiment Station. The Experimental Forest serves as a field laboratory for research. Experiments are conducted to evaluate the effects of silvicultural practices on growths and yield of ponderosa and lodgepole pine. The effects of harvesting on soil moisture and other resources are also being evaluated. The role of fire in natural ecosystems is being investigated.

#### (4) Resource Management Criteria and Assumptions

##### (a) Fire Management

Suppression should be aggressive and aimed at minimizing acres burned and trees damaged. Low impact methods should be utilized whenever possible.

Prescribed fire will be used only in conjunction with approved research projects.

##### (b) Minerals and Energy Development and Leasing

According to Forestwide Standards and Guidelines.

##### (c) Pest Management

According to Forestwide Standards and Guidelines.

(d) Range

According to Forestwide Standards and Guidelines.

(e) Recreation

These areas will emphasize recreation opportunities appropriate for and commensurate with Forest research including casual observation and interpretation of experimental activities, environmental education, and hunting.

Generally, these recreation experiences will fall into the ROS category of Roaded-Natural.

(f) Soils and Water

Bank erosion control using natural vegetation along the Deschutes River can be implemented.

(g) Special Uses

According to Forestwide Standards and Guidelines.

(h) Timber/Vegetative Management

Timber harvesting is not scheduled in FORPLAN, but can be managed on an unregulated basis.

(i) Transportation System

According to Forestwide Standards and Guidelines.

(j) Visual

Inventoried Visual Quality Objectives should be met in the foreground areas along the Deschutes River.

(k) Wildlife

Where possible, research activities will protect active nests of raptors.

1.35 snags per acre will be left for cavity nesters.

Two dead and down logs per acre should be left after research activities are completed. Such logs should be greater than 12 inches in diameter on the large end and a minimum of 20 feet long.

## E. Development of Timber Options

### 1. Introduction

Section III.D above describes the fourteen Management Areas and their associated prescriptions. It also discussed the relationship between the Management Area Prescriptions and the Forestwide Standards and Guidelines. This section will summarize the development of FORPLAN timber prescriptions and their relationship to the Management Area Prescriptions. A more detailed documentation of the process can be found in the Forest Planning documents titled "Empirical Yield Tables" and "Managed Yield Tables", and the FORPLAN "PNV With Detail" analysis.

### 2. Overview of Process

Once the Managemeet Area Prescriptions were identified which were needed to address the Planning ICO's, the ID Team determined which of them could have their objectives achieved through scheduled (regulated) timber harvesting. Of the fourteen Management Area Prescriptions depicted in Section III.D, five of them included scheduled timber harvesting prescriptions which were analyzed within the FORPLAN model. These included:

a. General Forest
b. Scenic Views
c. Deer Habitat
d. Bald Eagles & Spotted Owls
e. Intensive Recreation

The Wilderness and the Research Natural Area Management Prescriptions do not permit any timber harvesting, while the remaining areas permit timber harvesting on an unregulated basis. None of these Management Areas required the development of harvest scheduling prescriptions for FORPLAN.

Some FORPLAN terminology should probably be explained here. The FORPLAN prescriptions are identified and described in terms of "management emphases" and "management intensities". In most cases, the management emphasis name in FORPLAN is the same as the Management Area Prescription name used in the DEIS and Forest Plan. For example, "General Forest" is the name of a Management Area Prescription and a FORPLAN management emphasis. This is also true for the Deer Habitat, Intensive Recreation, and Bald Eagle and Spotted Owl Management Areas. However, the Scenic Views Management Area is composed of three different management emphases in FORPLAN. These are (1) Retention Foreground, (2) Partial

Retention Foreground, and (3) Middleground Retention and Partial Retention. The list below depicts these relationships.

| Management Area | Management Emphasis | Emphasis Abrev. |
|---|---|---|
| General Forest | General Forest | GF |
| Scenic Views | Middleground | MG |
| | Retention Foreground | RF |
| | Partial Ret. Foreground | PF |
| Deer Habitat | Deer Habitat | DH |
| Bald Eagles & S. Owls | Bald Eagles & Spotted Owls | TE |
| Intensive Recreation | Intensive Recreation | IR |

The silviultural options that were developed for each of these management emphases are referred to as "management intensities" in FORPLAN. They reflect the different combinations of practices, and the different timing choices for implementing those practices. In essence, they represent alternative investment levels in timber management to achieve the objectives of a management area. The list below depicts some of the management practice terms we will use to help describe the various management intensities considered for each management emphasis. Not all practices that will be implemented as part of a prescription are included in this list.

| Management Practices | Practice Abrev. |
|---|---|
| Natural Regeneration | NR |
| Plant | PLT |
| Precommercial Thin | PCT |
| Commercial Thinning | CT |
| Overstory Removal | OR |
| Shelterwood | SW |
| Final Harvest (Clearcut or Shelterwood) | FH |

The next step was to develop and analyze a range of silvicultural prescriptions for each working group and management area combination. This included the development of both empirical and managed yield tables. The empirical yield tables are used to portray alternative silvicultural treatment options for existing mature and immature sawtimber stands. They are called empirical because they are based in part on Continuous Forest Inventory plot data. The managed yield tables apply both to existing plantations, none of which are older than 20 years, and to future managed stands which result from the regeneration harvesting of existing natural stands. The silvicultural prescriptions and their associated yield tables were developed based on the silvilcultural characteristics of each working group and the stand management objectives for each individual Management Area.

Once the vegetative management objectives were identified for each Management Area, the appropriate Interdisciplinary Team members would work together to develop a range of harvest scheduling options. The overriding criteria in this process was that the silvicultural prescription and its associated yield table achieve the vegetative management objectives for the Management Area. However, other criteria were also considered. One of them was that a range of scheduling timing choices, rotation ages, and investment levels were examined, and whenever possible made available to the FORPLAN model. For example, the Model was given six different silvicultural regimes to choose from when deciding how to manage lodgepole pine plantations in the General Forest Management Area. Each had different schedules of silvicultural practices, spacing arrangements, and rotation lengths. All of them achieved the intent of the General Forest Management Area.

However, in some cases it was necessary to reduce the number of prescriptions included in the Model in order to keep it within acceptable size limits. For this purpose, the range of available prescriptions for a particular management area were examined. Present net values (or soil expectation values for managed stands) were calculated for each. Those which were less efficient and/or did not contribute significantly to the range of reasonable harvesting options were dropped.

Finally, there were situations in which the vegetative management objectives for a Management Prescription were so specific that the range of silvicultural regimes that could achieve those objectives was very limited. This was probably most true for the Bald Eagle and Spotted Owl Management Prescription which called for two to three storied stands containing 8 to 10 350-year old open top limby trees.

### 3. Range of Timber Management Options Considered

As discussed in Section III C, analysis areas were delineated in part by four working group identifiers (PPN, LPP, MC, and MH) and five existing vegetative condition classes (Regen, Seeds & Saps, Immature Sawtimber, Mature Sawtimber, and Two-Storied Stands). These analysis area identifiers depicted stands which were classified as suitable and available lands for timber harvesting. FORPLAN timber management prescriptions were developed for every combination of management emphases which called for scheduled harvesting and analysis areas which contained suitable and available forested land. For any one prescription, the Model was also offered several timing choices on when to implement it. Also, for each management emphasis and analysis area combination which involved timber harvesting options, the Model could also select a prescription which called for no programmed harvesting. This prescription was used as the final economic suitability test. All in all, FORPLAN could select from any of 60,000 to 80,000 prescription/timing choice options to meet its objectives for a particular alternative.

Based on an analysis of the CFI plot data, the immature, mature, and two-storied analysis areas were stratified according to their existing inventory characteristics. Likewise, the silvicultural prescriptions and their associated yield tables that were developed for these analysis areas were based on regression analyses of the same data plus professional judgment. As would be expected, the older the stand, the fewer the silvicultural options that were realistically availble to management it. For example, in most cases the only option left for a mature stand is to harvest it and start a new managed stand. The prescriptions for two-storied stands consisted of either a final harvest or an overstory removal. Immature sawtimber stands offered more options. Several patterns of commercial thinnings were possible, or they could be harvested and regenerated. In total, the model contained 84 optional yield tables for existing stands. Its limits are 99.

Managed yield tables were developed for prescriptions involving analysis areas in the regeneration, or seeds and saplings condition (i.e., existing plantations), and for future managed stands resulting from the conversion of existing natural stands. For this purpose, each working group was substratified into two to three productivity levels based on an analysis of its plant community composition. Probably from 150 to 200 managed yield tables were examined. Eighty-eight managed yield tables were included in FORPLAN. Again, its upper limit is 99.

The prescriptions included in the FORPLAN model covered a wide range of timber management options:

a. Plant-Final Harvest (PL-FH)

b. Natural Regen-Shelterwood-Final Harvest (NR-SW-FH)

c. Plant-Precommercial Thin-Final Harvest (PL-PCT-FH)

d. Natural Regen-Precommercial Thin-Shelterwood-Final Harvest (NR-PCT-SW-FH)

e. Plant-Commercial Thinnings-Final Harvest (PL-CT-FH),

f. Natural Regen-Commercial Thinnings-Shelterwood-Final Harvest (NR-CT-SW-FH)

g. Plant-Precommercial Thin-Commercial Thinnings-Final Harvest (PL-PCT-CT-FH)

h. Natural Regen-Precommercial Thin-Commercial Thinnings -Shelterwood-Final Harvest (NR-PCT-CT-SW-FH)

The full range of management intensities was available for the General Forest and Middleground management emphases. The other management emphases were usually restricted to the more intensive silvicultural regimes due to the specifics of their objectives. The following tables present a summary comparison of the timber management options developed for each of the four working groups and their respective productivity stratifications.

TABLE 7a

MANAGED YIELD TABLE SUMMARY FOR THE DESCHUTES NATIONAL FOREST
PONDEROSA PINE WORKING GROUP

| Strata | Management Emphasis | Yield Table No. | Silvicultural Activity Sequence | .95 CMAI Rotation | | CMAI 1/ or Extended Rotation 3/ | | | | CRAI 5/ and % Reduction In CRAI 5/ Compared to General Forest Intensive Strategy 6/ | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Age | MAI 2/ | Age | MAI 2/ | Tot.Prod. 4/ | d.b.h. | | |
| Bend, Crescent, & Fort Rock RD's plus all Deer Winter Range | General Forest, Middleground, Scenic Views | 1. | PLT-PCT-3CT-FH | 85 | 42.9 | 115 | 44.3 | 5,098 | 20.6 | 46.2 | - |
| | | 2. | NR-PCT-3CT-SW-FH | 85 | 42.9 | 115 | 44.3 | 5,098 | 20.6 | 39.2 | 15 |
| | | 3. | PLT-2CT-FH | 95 | 41.9 | 115 | 43.4 | 4,991 | 19.8 | 45.2 | 2 |
| | | 4. | NR-2CT-SW-FH | 105 | 51.5 | 125 | 53.2 | 6,653 | 15.7 | 47.5 | 0 |
| | | 5. | PLT-PCT-FH | 65 | 40.9 | 75 | 42.2 | 3,167 | 12.7 | 43.0 | 7 |
| | | 6. | NR-PCT-SW-FH | 65 | 40.9 | 75 | 42.2 | 3,167 | 12.7 | 35.2 | 24 |
| | | 7. | PLT-FH | 75 | 38.0 | 85 | 38.5 | 3,271 | 13.0 | 39.5 | 15 |
| | | 8. | NR-SW-FH | 55 | 42.2 | 65 | 43.8 | 2,848 | 8.0 | 35.6 | 23 |
| | Foreground Retention, Intensive Recreation | 9. | PLT-PCT-4CT-FH | 115 | 44.1 | 285 | 31.9 | 8,280/<br>9,104 7/ | 32.2 | 29.2 | 37 |
| | | 10. | NR-PCT-4CT-SW-FH | 115 | 44.1 | 285 | 31.9 | 8,280/<br>9,104 7/ | 32.2 | 25.9 | 44 |
| | Foreground, Partial Retention | 11. | PLT-PCT-3CT-FH | 115 | 44.1 | 155 | 41.6 | 6,445 | 24.9 | 43.8 | 5 |
| | | 12. | NR-PCT-3CT-SW-FH | 115 | 44.1 | 155 | 41.6 | 6,445 | 24.9 | 37.9 | 18 |
| | Deer Habitat | 13. | PLT-PCT-3CT-FH | 85 | 44.9 | 115 | 46.5 | 5,349 | 19.5 | 48.5 | 0 |
| | | 14. | NR-PCT-3CT-SW-FH | 85 | 44.9 | 115 | 46.5 | 5,349 | 19.5 | 41.2 | 11 |
| | Threatened & Endangered Species | 15. | PLT-PCT-6CT-FH | 115 | 44.1 | 345 | 30.6 | 10,548 | 40.7 | 32.8 | 29 |
| | | 16. | NR-PCT-6CT-SW | 115 | 44.1 | 345 | 30.6 | 10,548 | 40.7 | 29.3 | 37 |

1/ Culmination of Mean Annual Increment.
2/ Mean Annual Increment (CF/A/YR).
3/ 100 percent of culmination except where management emphasis requires extended rotation.
4/ Total volume production, CF/A, 4-inch top.
5/ Culmination of mean annual increment, including regeneration time delay, extended rotations, genetic gain in planted stands, and inter-tree competition, gross volume of harvested trees.
6/ Intensive strategy is PLT-PCT-3CT-FH sequence at CMAI.
7/ Volume available for harvest/total volume production.

TABLE 7b

MANAGED YIELD TABLE SUMMARY FOR THE DESCHUTES NATIONAL FOREST
PONDEROSA PINE WORKING GROUP

| Strata | Management Emphasis | Yield Table No. | Silvicultural Activity Sequence | .95 CMAI Rotation Age | .95 CMAI Rotation MAI 2/ | CMAI 1/ or Extended Rotation 3/ Age | CMAI 1/ or Extended Rotation 3/ MAI 2/ | CMAI 1/ or Extended Rotation 3/ Tot.Prod. 4/ | d.b.h. | CRAI 5/ and | % Reduction In CRAI 5/ Compared to General Forest Intensive Strategy 6/ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sisters RD Minus Deer Winter Range | General Forest, Middle-ground, Scenic Views | 17. | PLT-PCT-3CT-FH | 85 | 60.7 | 105 | 62.7 | 6,582 | 20.7 | 65.0 | - |
| | | 18. | NR-PCT-3CT-SW-FH | 85 | 60.7 | 105 | 62.7 | 6,582 | 20.7 | 54.9 | 16 |
| | | 19. | PLT-2CT-FH | 85 | 56.3 | 105 | 59.0 | 6,192 | 21.1 | 61.2 | 6 |
| | | 20. | NR-2CT-SW-FH | 85 | 70.6 | 105 | 74.2 | 7,790 | 15.5 | 64.9 | 0 |
| | | 21. | PLT-PCT-FH | 65 | 52.5 | 75 | 52.8 | 3,957 | 14.1 | 53.8 | 17 |
| | | 22. | NR-PCT-SW-FH | 65 | 52.5 | 75 | 52.8 | 3,957 | 14.1 | 44.0 | 32 |
| | | 23. | PLT-FH | 65 | 47.5 | 75 | 49.1 | 3,685 | 13.6 | 50.1 | 23 |
| | | 24. | NR-SW-FH | 55 | 57.7 | 65 | 59.5 | 3,870 | 9.0 | 48.4 | 26 |
| | Foreground Retention, Intensive Recreation | 25. | PLT-PCT-5CT-FH | 115 | 62.8 | 285 | 44.6 | 11,479/<br>12,717 7/ | 38.4 | 39.2 | 40 |
| | | 26. | NR-PCT-5CT-SW-FH | 115 | 62.8 | 285 | 44.6 | 11,479/<br>12,717 7/ | 38.4 | 34.8 | 47 |
| | Foreground, Partial Retention | 27. | PLT-PCT-4CT-FH | 115 | 62.8 | 155 | 59.1 | 9,167 | 27.4 | 62.3 | 4 |
| | | 28. | NR-PCT-4CT-SW-FH | 115 | 62.8 | 155 | 59.1 | 9,167 | 27.4 | 53.9 | 17 |
| | Threatened & Endangered Species | 29. | PLT-PCT-7CT-FH | 115 | 62.8 | 345 | 43.0 | 14,838 | 46.3 | 46.1 | 29 |
| | | 30. | NR-PCT-7CT-SW-FH | 115 | 62.8 | 345 | 43.0 | 14,838 | 46.3 | 41.2 | 37 |

1/ Culmination of Mean Annual Increment
2/ Mean Annual Increment (CF/A/YR)
3/ 100 percent of culmination except where management emphasis requires extended rotation
4/ Total volume production, CF/A, 4-inch top
5/ Culmination of mean annual increment, including regeneration time delay, extended rotation, genetic gain in planted stands, and inter-tree competition, gross volume of harvested trees.
6/ Intensive strategy is PLT-PCT-3CT-FH sequence at CMAI
7 Volume available for harvest/total volume production

# TABLE 7c

## MANAGED YIELD TABLE SUMMARY FOR THE DESCHUTES NATIONAL FOREST
## LODGEPOLE PINE WORKING GROUP

| Strata | Management Emphasis | Yield Table No. | Silvicultural Activity Sequence | .95 CMAI Rotation Age | .95 CMAI Rotation MAI 2/ | CMAI 1/ or Extended Rotation 3/ Age | CMAI 1/ or Extended Rotation 3/ MAI 2/ | CMAI 1/ or Extended Rotation 3/ Tot.Prod. 4/ | d.b.h. | CRAI 5/ and % Reduction In CRAI 5/ Compared to General Forest Intensive Strategy 6/ | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Crescent & Fort Rock RD | General Forest, Middleground, Scenic Views, Foreground Retention & Partial Retention, Intensive Recreation | 31. | PLT/NR-12x12 PCT-2CT-FH | 75 | 43.1 | 85 | 43.8 | 3,720 | 13.3 | 44.9/41.3 | 0/8 |
| | | 32. | PLT/NR-15x15 PCT-2CT-FH | 75 | 38.5 | 95 | 39.7 | 3,771 | 15.6 | 41.0/37.7 | 9/16 |
| | | 33. | PLT/NR-10x10 PCT-3CT-FH | 65 | 42.9 | 85 | 44.3 | 3,761 | 13.9 | 45.4/41.8 | 0/7 |
| | | 34. | PLT/NR-2CT-FH | 85 | 38.1 | 105 | 39.8 | 4,180 | 13.5 | 41.3/38.0 | 8/15 |
| | | 35. | PLT/NR-16.5x16.5 PCT-FH | 55 | 32.2 | 65 | 33.5 | 2,174 | 11.1 | 33.8/31.1 | 25/31 |
| | | 36. | PLT/NR-FH | 55 | 32.2 | 65 | 33.3 | 2,167 | 8.5 | 33.6/31.0 | 25/31 |
| Bend and Sisters RD | General Forest, Middleground, Scenic Views, Foreground Retention & Partial Retention, Intensive Recreation | 37. | PLT/NR-12x12 PCT-2CT-FH | 75 | 46.8 | 105 | 48.2 | 5,065 | 16.3 | 50.1/46.0 | 0/8 |
| | | 38. | PLT/NR-15x15 PCT-2CT-FH | 65 | 43.2 | 95 | 45.0 | 4,270 | 16.3 | 46.4/42.7 | 7/15 |
| | | 39. | PLT/NR-10x10 PCT-3CT-FH | 55 | 47.5 | 85 | 49.9 | 4,238 | 14.7 | 51.2/47.1 | 0/6 |
| | | 40. | PLT/NR-2CT-FH | 85 | 44.3 | 105 | 45.99 | 4,829 | 14.3 | 47.7/43.9 | 5/12 |
| | | 41. | PLT/NR-16.5x16.5 PCT-FH | 55 | 37.3 | 65 | 39.0 | 2,532 | 11.8 | 39.3/36.2 | 22/28 |
| | | 42. | PLT/NR-FH | 45 | 40.8 | 45 | 40.8 | 1,835 | 7.5 | 39.9/36.7 | 20/27 |

1/ Culmination of Mean Annual Increment
2/ Mean Annual Increment (CF/A/YR)
3/ 100 percent of culmination except where management emphasis requires extended rotation
4/ Total volume production, CF/A, 4-inch top
5/ Culmination of mean annual increment, including regeneration time delay, extended rotation, genetic gain in planted stands, and inter-tree competition, gross volume
6/ Intensive strategy is PLT-12x12 PCT-2CT-FH sequence at CMAI (reduction in plant strategy/reduction in natural regenerate strategy)

TABLE 7d

MANAGED YIELD TABLE SUMMARY FOR THE DESCHUTES NATIONAL FOREST
MIXED CONIFER WORKING GROUP

| Strata | Management Emphasis | Yield Table No. | Silvicultural Activity Sequence | .95 CMAI Rotation Age | .95 CMAI Rotation MAI 2/ | CMAI 1/ or Extended Rotation 3/ Age | CMAI 1/ or Extended Rotation 3/ MAI 2/ | CMAI 1/ or Extended Rotation 3/ Tot.Prod. 4/ | d.b.h. | CRAI 5/ | % Reduction In CRAI 5/ Compared to General Forest Intensive Strategy 6/ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Bend & Crescent RD | General Forest, Middleground, Scenic Views | 43. | PLT-PCT-3CT-FH | 75 | 49.7 | 95 | 51.1 | 4,856 | 17.6 | 52.8 | -- |
| | | 44. | PLT-2CT-FH | 95 | 56.3 | 125 | 59.0 | 7,371 | 14.8 | 61.6 | 0 |
| | | 45. | PLT-PCT-FH | 75 | 48.7 | 85 | 49.1 | 4,170 | 13.7 | 50.4 | 5 |
| | | 46. | PLT-FH | 45 | 50.4 | 55 | 52.5 | 2,885 | 7.7 | 52.3 | 1 |
| | Foreground Retention, Intensive Recreation | 47. | PLT-PCT-3CT-FH | 95 | 51.1 | 155 | 47.5 | 7,356 | 23.5 | 50.0 | 5 |
| | Foreground, Partial Retention | 48. | PLT-PCT-3CT-FH | 95 | 51.1 | 135 | 49.5 | 6,686 | 22.1 | 51.9 | 2 |
| | Threatened & Endangered Species | 49. | PLT-PCT-5CT-SW | 95 | 51.1 | 345 | 32.5 | 8,312/<br>11,197 7/ | 39.4 | 20.7 | 61 |
| Fort Rock RD | General Forest, Middleground, Scenic Views | 50. | PLT-PCT-3CT-FH | 75 | 37.1 | 85 | 38.4 | 3,265 | 15.4 | 39.4 | 0 |
| | | 51. | PLT-PCT-FH | 65 | 36.7 | 85 | 38.5 | 3,275 | 12.7 | 39.6 | 0 |
| | | 52. | PLT-FH | 45 | 40.2 | 55 | 40.8 | 2,246 | 7.1 | 40.7 | 0 |
| | Foreground Retention, Intensive Recreation | 53. | PLT-PCT-3CT-FH | 85 | 38.4 | 155 | 35.7 | 5,539 | 25.6 | 37.6 | 5 |
| | Foreground, Partial Retention | 54. | PLT-PCT-3CT-FH | 85 | 38.4 | 135 | 37.1 | 5,006 | 22.2 | 38.9 | 1 |

1/ Culmination of Mean Annual Increment
2/ Mean Annual Increment (CF/A/YR)
3/ 100 percent of culmination except where management emphasis requires extended rotation
4/ Total volume production, CF/A, 4-inch top
5/ Culmination of mean annual increment, including regeneration time delay, extended rotation, genetic gain in planted stands, and inter-tree competition, gross volume
6/ Intensive strategy is PLT-PCT-3CT-FH sequence at CMAI
7/ Volume available for harvest/total volume production

TABLE 7e

MANAGED YIELD TABLE SUMMARY FOR THE DESCHUTES NATIONAL FOREST
MIXED CONIFER WORKING GROUP

| Strata | Management Emphasis | Yield Table No. | Silvicultural Activity Sequence | .95 CMAI Rotation |  | CMAI 1/ or Extended Rotation 3/ |  |  | d.b.h. | CRAI 5/ and % Reduction In CRAI 5/ Compared to General Forest Intensive Strategy 6/ |  |
|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  | Age | MAI 2/ | Age | MAI 2/ | Tot.Prod. 4/ |  |  |  |
| Sisters RD | General Forest, Middle-ground, Scenic Views | 55. | PLT-PCT-3CT-FH | 75 | 107.3 | 115 | 110.0 | 12,664 | 23.1 | 114.5 | -- |
|  |  | 56. | PLT-3CT-FH | 65 | 120.64 | 85 | 124.3 | 10,565 | 15.8 | 127.6 | 0 |
|  |  | 57. | PLT-PCT-FH | 65 | 104.8 | 75 | 106.5 | 7,989 | 13.7 | 108.6 | 5 |
|  |  | 58. | PLT-FH | 55 | 111.2 | 55 | 111.2 | 6,118 | 9.7 | 110.8 | 3 |
|  | Foreground Retention, Intensive Recreation | 59. | PLT-PCT-3CT-FH | 115 | 110.0 | 155 | 103.8 | 16,084 | 27.3 | 109.3 | 5 |
|  | Foreground, Partial Retention | 60. | PLT-PCT-3CT-FH | 115 | 110.0 | 135 | 108.5 | 14,650 | 25.6 | 113.7 | 1 |
|  | Threatened & Endangered Species | 61. | PLT-PCT-5CT-SW | 115 | 110.0 | 345 | 73.26 | 19,533/<br>25,274 7/ | 47.3 | 49.1 | 57 |

1/ Culmination of Mean Annual Increment
2/ Mean Annual Increment (CF/A/YR)
3/ 100 percent of culmination except where management emphasis requires extended rotation
4/ Total volume production, CF/A, 4-inch top
5/ Culmination of mean annual increment, including regeneration time delay, extended rotation, genetic gain in planted stands, and inter-tree competition, gross volume
6/ Intensive strategy is PLT-PCT-3CT-FH sequence at CMAI
7/ Volume available for harvest/total volume production

## TABLE 7f

## MANAGED YIELD TABLE SUMMARY FOR THE DESCHUTES NATIONAL FOREST
## MOUNTAIN HEMLOCK WORKING GROUP

| Strata | Management Emphasis | Yield Table No. | Silvicultural Activity Sequence | .95 CMAI Rotation |  | CMAI 1/ or Extended Rotation 3/ |  |  |  |  |
|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  | Age | MAI 2/ | Age | MAI 2/ | Tot.Prod. 4/ | d.b.h. | CRAI 5/ |
| All Districts | All Emphasis Areas | 62. | NR-SW-FH | 85 | 33.1 | 105 | 34.0 | 3,570 | 9.0 | 28.6 |

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1/ Culmination of Mean Annual Increment
2/ Mean Annual Increment (CF/A/YR)
3/ 100 percent of culmination except where management emphasis requires extended rotation
4/ Total volume production, CF/A, 4-inch top
5/ Culmination of mean annual increment, including regeneration time delay, extended rotation, genetic gain in planted stands, and inter-tree competition, gross volume of harvested trees

## F. Development of Per Acre Yield Coefficients

The Deschutes National Forest developed its first FORPLAN model during the summer of 1980. It has evolved through several versions and modelling philosophies since then. The original models contained yield coefficients for the timber, recreation, range, visual, and wildlife resources. These model formulations were very big and expensive to run. At times the matrices were either too big to generate, or consumed days and thousands of dollars to solve. The Team was forced to rethink its modelling philosophy because there was no way to capture all the intricacies of the timber, recreation, range, and wildlife interactions in one model and have it produce meaningful results.

As the Interdisciplinary Team gained more experience with running the Model and analyzing solutions, we began to pare away at its size by removing prescriptions and yield coefficients that did not contribute to reasonable allocation and scheduling decisions. In general, these included the prescriptions and output coefficients related to different investment levels for the recreation and range resources. It was decided that the outputs and effects of these resources could be more easily and meaningfully analyzed outside of the FORPLAN model with the use of electronic spreadsheets. However, the timber harvest scheduling prescriptions that were designed to meet the management objectives for these resources were retained in the Model.

FORPLAN evolved to consist primarily of a wide range of harvest scheduling prescriptions which were designed to achieve the multiple use resource management objectives associated with the various Management Area land allocation choices. In this section we will summarize the processes used to develop the resource outputs and effects coefficients used in the final version of the FORPLAN model. Due to its importance, we will also discuss the development of the recreation supply and consumption coefficients even though they were not included in the final version of the Model. Even though the timber and recreation resources were at the heart of many Planning Issues and together accounted for over 95 percent of the present net value associated with any of the alternatives, the outputs and effects of many other resources were also evaluated for each alternative. These include the energy, minerals, range, soils, visuals, wildlife, and water resources. The development of the coefficients for these resources will not be covered in this discussion. For the details regarding these resources, refer to process records in the Supervisor's Office and the following Forest Planning Documents:

(1) Wildlife Resource
(2) Water Resource
(3) Diversity and Old Growth
(4) Range Resource
(5) Visual Resource

Finally, the process for developing the economic cost and benefit coefficients for the FORPLAN prescriptions will be presented in Section IV of this Appendix.

## 1. Timber Yield Coeficients

The development of timber yield tables was an important step in the Deschutes National Forest Planning process. They are a component of the FORPLAN model which is used to calculate the allowable sale quantity, long run sustained yield, and schedule of timber harvest activities. An Interdisciplinary Team of wildlife biologists, landscape architects, economists, silviculturalists, and timber management personnel at the Ranger District, Forest, and Regional Office levels were involved in the process. The yield tables were reviewed at several points. Initial review was made by District personnel who compared the tables with their personal experiences on the ground. Other reviews were made by researchers, neighboring Forests, and industry silviculturalists.

Yield coeficients were developed for all Management Area prescriptions and analysis area combinations which permitted regulated timber harvest scheduling. This involved the development of both empirical yield tables for existing sawtimber stands, and managed yield tables for existing plantations and future managed stands. They will be discussed separately in the following sections.

### a. Timber Yield Coefficients for Existing Sawtimber Stands

The purpose of empirical yield tables is to estimate the existing immature and mature standing inventory of wood fiber on a per acre basis and to predict how it would grow according to weighted average site conditions and specified silvicultural regimes. The predicted volumes pertain to live green wood in trees 5 inches diameter breast height (d.b.h.) and larger to 4 inch tops. The volume tables are calculated in cubic feet. The associated cubic foot yield coefficients were entered into the relevant FORPLAN prescriptions. The cubic foot outputs from FORPLAN were later converted to Scribner Decimal C Boardfeet based on working group and diameter class specific conversion ratios. This section summarizes the empirical yield table estimation process. Additional details can be found in the Forest Planning Document titled "Empirical Yield Tables".

The information source for most of these estimates is the plot data from the 1971 Continuous Forest Inventory (CFI). These plots were stratified into a Timber Resource Model (TRM). The Timber Resource Model was developed to help characterize the existing timber inventory and associated spectrum of management opportunities and their respective yields. The model is a square matrix formed by the intersection of four working groups (columns) and four silvicultural/maturity classes (rows). The four working groups are (1) ponderosa pine, (2) lodgepole pine, (3) mixed conifer, and (4) mountain hemlock. While each working group name implies species purity, they are actually composed of a mix of associated species. This multiple species representation by working groups must be accounted for when evaluating both the development of empirical yield tables and the FORPLAN timber outputs.

The maturity classifications are (1) mature sawtimber, (2) immature sawtimber, (3) seedlings and saplings, and (4) regeneration. The classification is tied to silvicultural opportunities. For example, the next logical silvicultural treatment of a mature sawtimber stand would be some form of regeneration harvest or overstory removal. On the other hand, an immature sawtimber stand probably has some options for commercial thinnings and regeneration harvests. In general, the younger the stand the more management options there are to choose from.

Empirical yield tables were constructed for the seven model components classified as mature or immature sawlogs. The growth and yield projections for the six components classified as reforestation or seedlings/saplings were based on managed yield tables. (NOTE: Three model components were null.) Following the TRM plot stratification, regression analysis was performed on the plot data for each immature and mature model component in order to develop the necessary basal area, growth, and volume equations. Selected equations, which normally had the highest correlation (R squares) values, were then incorporated into the Region 6 empirical yield table computer program (PROGVG).

The plots were stratified again to capture the within forest standing volume variation that occurs between the working groups and maturity classes. In previous harvest scheduling analyses on the Deschutes National Forest, Forestwide average yield tables for each of the four working groups were used to represent the growth and yields of both existing inventories and future managed stands. These yield tables were probably adequate for the determination of Forestwide harvest levels. However, as the needs for more site specific analyses during the land management planning process increased, so did the need for more site specific estimates of inventory, and projected growth and yields. Therefore, it became desirable to further stratify the seven mature and immature timber model components in order to reflect the variation in per acre standing inventories that exist across the Forest. To make them best fit into the FORPLAN harvest scheduling analyses for the Forest Plan, the seven empirical model components were stratified by Ranger District (FORPLAN Level 1) and deer winter range (FORPLAN Level 3 and a surrogate for desert fringe community types).

To accomplish this, the CFI plot locations and the FORPLAN Level 1 (Ranger Districts) and Level 3 (Deer Winter Range) identifiers were overlayed with the R2MAP computerized grid mapping system. Averages for site index, age, basal area, standing volume, and growth were then calculated for each of the resulting geographic model component stratifications.

Next, a statistical T-test was performed on the cubic foot per acre standing volume estimates to help decide which geographic model components were similar or different to each other at the 90 percent confidence level. Based on this analysis, some of the geographic model components were pooled and the summary statistics were recalculated.

Base empirical yield tables were then developed for each of the resulting thirteen geographically stratified immature and mature timber model components. These tables portray the live green and growing cubic feet volume per acre in trees 5 inches d.b.h. and larger for stands which continue to grow in an unmanaged condition.

The base yield tables were calculated using the PROGVG empirical yield table development software package. As mentioned above, the growth and yield equations in PROGVG are the results of the regression analysis performed on the plot data associated with each of the timber model working group and maturity class components. Several runs were done with the program before the final base yield tables were arrived at. The initial runs involved projecting and calibrating the growth and yields based on the 1971 site index, age, and volume summary statistics for each stratification. These often had to be run two or three times in order to calibrate the basal area and growth rate parameters so they were consistent with the average basal areas and growth rates for each strata. After these were all in order, the program was run one more time with the starting age, and volume set at the year 1990 values from the previous calibrated runs which were based on the year 1971 starting values.

This work resulted in thirteen base empirical yield tables. They are considered base because before they were entered into FORPLAN a few adjustments were necessary. The first set of modifications was sometimes needed to make the base curves more reasonable in terms of growth rates and volume projections. This was particularly true for the mature lodgepole pine curve which was based on plot data taken before the mountain pine beetle epidemic occurred. The second set of modifications was done in order to represent alternative silvicultural investment levels and resource management objectives since the base curves projected only the continued natural growth of the stands.

Another set of adjustments was made to account for unharvested volumes representing green replacement snag trees left in order to maintain alternative amounts of habitat for cavity nesters. The associated per acre volume reductions represent an adequate number and size distribution of future snag trees needed to provide habitat for specified percentages of the cavity nester population potential. The wildlife tree management goals were based on the concept of maximum population potentials (MPP) for primary excavator species (woodpeckers).1/

All in all, 37 different yield tables were developed for the immature and mature sawtimber analysis areas in the model.

b. Timber Yield Coefficients for Managed Stands

The purpose of managed yield tables is to estimate the standing inventory of wood fiber on existing plantations and future managed stands on a per acre basis and to predict how it would grow according to weighted average site conditions and alternative silvicultural regimes. Yield tables were developed for all Management Areas which permitted regulated timber harvest scheduling. They were calculated and entered into FORPLAN as cubic feet per acre coefficients. This section summarizes the managed yield table development process. A more in-depth discussion can be found in the Forest Planning Document titled "Managed Yield Tables".

For planning purposes, the timber inventory of the Deschutes National Forest was categorized into four working groups (1) ponderosa pine, (2) lodgepole pine, (3) mixed conifer, and (4) mountain hemlock. In the past, managed yield table growth rates for the four working groups were based upon forestwide productivity averages. The resulting yield tables were adequate for analyzing forestwide harvest levels, but not for capturing enough of the within Forest productivity variability for the more site specific questions now being addressed in Forest Planning. Consequently, it was decided that the new managed yield tables should be stratified to reflect the productivity variability that exists within working groups across the Forest.

1/ J.W. Thomas, "Wildlife Habitats in Managed Forests in the Blue Mountains of Oregon and Washington", U.S. Forest Service, Agriculture Handbook 533, 1979.

Since the oldest managed stand on the Forest is only about two decades old, there is very little empirical data specific to the Deschutes National Forest that could be used for stratification. Therefore, many of the decisions were based on available research and professional judgment. Several T-tests were performed on the site class information from the 1971 inventory plots. However, the resulting stratification, based on a 90 percent confidence level, was not very decisive or intuitively realistic. A similar test was considered using the ecoclass cubic foot per acre per year productivity rates as determined from Leonard Volland's "Plant Associations of the Central Oregon Pumice Zone,"[2/] publication. However, it would have been necessary to perform a Monte Carlo simulation in order to generate the type of sampling distribution data needed for a correct statistical test.

It was decided at that time that the yield tables should be stratified for each working group by Ranger District (FORPLAN Level 1) and by deer winter range (FORPLAN Level 3 and a surrogate for the desert fringe community types) on the basis of weighted averages of the respective ecoclass CF/acre/yr productivity rates. Since the data was not in an appropriate form for performing statistical analyses of the similarities and differences between the possible strata components, professional judgment was used to develop the final stratifications. The rule of thumb was that if the weighted average productivity rates were within 10 percent of each other they would be considered to be similar, or within the same strata.

For this purpose, each plant community was assigned to one of the Forests' mapped ecoclasses. This process resulted in the assignment of 60 plant communities to 47 ecoclass complexes. Then the GBA and site index averages were calculated for each ecoclass. Since the Forest did not have a plant community mapping, we did not know how many acres of each plant community were within a particular ecoclass. Therefore, these parameters were derived from simple arithmetic averages as opposed to weighted averages.

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[2/] Leonard A. Volland, "Plant Associations of the Central Oregon Pumice Zone, R6-ECOL-104-1982.

Next, the number of acres of each ecoclass within each geographically delineated working group strata was determined. A weighted average site index and GBA was calculated for each strata based on its ecoclass composition. The resulting averages were then used in the stratification and yield table development process.

The Growth and Yield IV Model was used to predict diameter growth at breast height (d.b.h.). The model is based on the GBA concept developed by Fred Hall[3/]. Input parameters include GBA, trees per acre, maximum diameter growth, species, and a mortality function based on stand density index models. The early growth predicted for the managed yield tables was initially simulated using the Growth and Yield IV model, but was adjusted based on professional judgment, benchmark plantation data, and additional field measurements since the age/GBA relationship is poorly defined for young stands less than 30 years old at d.b.h.

With the inputs of GBA, trees per acre, age and beginning diameters, the model's output was a new diameter calculated for each succeeding year. A secondary output was basal area per acre. Basal area was used as an index for determining when thinning entries should be scheduled, in order to maintain an acceptable growth rate. In response to thinning, the model displayed new diameter growth which reflected the new level of stocking.

The projected yields and the biological mean annual increment (MAI) were calculated by using the Region 6 Managed Yield Table (MGYLD5) Computer Program. The age, d.b.h. and trees per acre used for the calculations were taken from the Growth and Yield IV simulations. Height growth was predicted using the average site index for the strata, as discussed above. Form classes were predicted in consultation with the Forest check cruiser, District personnel who have been involved with second growth management, and previously published yield tables for Deschutes National Forest.

[3/] Fred C. Hall, "Growth Basal Area: A Field Method for Appraising Forest Site Potential for Stockability," Canadian Journal of Forest Research, 1983, 13(1):70-77

The MGYLD5 output consisted of 6 printed tables for each yield table: (1) the initial field input data, (2) basal area, (3) total stem volume in cubic feet, (4) cubic foot volume to a 4 inch top, (5) board foot volume to a 6 inch top, and (6) MAI and rotation mean annual increment (RAI).

MAI is the total cubic foot volume per acre produced up to a particular age divided by the age of the tree. In the yield tables, culmination of biological mean annual increment (CMAI) is the highest value of MAI calculated in Table 6. RAI is the cubic foot volume per acre produced up to a particular age divided by the total number of years since regeneration harvest. This includes the age plus any lag between the time the volume from the regeneration harvest is calculated until the time the seedlings for the next rotation are germinated and free to grow as predicted by the yield tables. On the Deschutes National Forest, the regeneration time lag is modeled at 5 years for most species and areas. Two exceptions modeled in the yield tables are ponderosa pine stands with extremely rocky soils or very high pocket gopher populations (15 year lag) and high elevation mountain hemlock stands which are often extremely slow or extremely expensive to regenerate (20 year lag). In the yield tables, culmination of rotation mean annual increment (CRAI) is the highest value of RAI calculated in Table 6.

For ponderosa pine, natural regeneration and an extended regeneration period has greater economic value than repeated plantings and hand baiting predicted for the areas with very high pocket gopher populations or the reduced stocking associated with nonplantable but stockable ground predicted for the very rocky areas. For mountain hemlock, the shelterwood system and natural regeneration have both greater economic efficiency and greater reliability in this high elevation type.

The yield tables produced from the MGYLD5 computer program were gross volumes based on full stocking. Before being entered in FORPLAN, they were adjusted to reflect the effects of fertilization, genetically improved seed sources, wildlife leave trees, intertree competition, defect, and nonstockable openings. The adjustments made to the 100 percent fully stocked base yield tables in order to account for these factors are discussed in the following sections.

(1) Fertilization

Because of (1) soil and climatic conditions on the Forest and (2) the high price and uncertainty of future fertilizer supplies, the yield tables were not adjusted for fertilization.

(2) Planting with Genetically Improved Stock

The choice of planting versus natural regeneration was based on working group and land class. For the ponderosa pine and mixed conifer working groups, planting was assumed on all areas except those with gophers and rocky soils. For lodgepole pine, the decision to plant versus natural regeneration depended upon site specific plant communities. In general, about 80 percent of the lodgepole working group could be regenerated naturally. In gopher or rocky areas, it was assumed lodgepole would regenerate naturally. It was also assumed that mountain hemlock would regenerate naturally.

In light of limited empirical data regarding the effects of genetically improved stock on the growth and yield of managed stands in Central Oregon, Regional direction was to assume an across the board increase in yield of 10 percent for all planted stands. However, little gain on the Deschutes National Forest will be realized until seedlings from seed orchards are produced in 2 to 4 decades. Therefore, the assumed positive 10 percent effect of using genetically improved stock has been reduced to 8.67 percent to reflect that these benefits would only be realized for the last 13 of 15 decades in the FORPLAN planning horizon. As a result, adjustments have been made to the ponderosa pine, lodgepole pine, and mixed conifer yield tables in areas with no gopher or rocky soil problems. These adjustments include the effects of a delay in seed orchard production as well as limited planting in lodgepole pine.

### (3) Wildlife Trees - Reduction for Snag Replacements

Wildlife tree management goals are based on the concept of maximum potential population[4] for primary excavator species (woodpeckers).

Managed yield volume reductions represent the volume reserved from managed stands to provide adequate snag numbers and sizes throughout the rotation. This includes those overstory trees retained at rotation to provide snags until the managed understory is of the appropriate size to satisfy wildlife tree needs. During the remainder of the rotation, trees from the managed stand will provide adequate snag numbers and sizes.

Managed yield volume reductions are based on three variables:

(a) the number of snags per acre required for specific levels of maximum potential population,

(b) the number of green wildlife trees (snag replacements) required, as determined by the rotation age and the average snag standing life, and

(c) the volume per tree reserved.

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[4] J.W. Thomas, "Wildlife Habitats in Managed Forests in the Blue Mountains of Oregon and Washington", U.S. Forest Service, Agriculture Handbook 533, 1979.

### (4) Wildlife Trees - Competitive Effect

The competitive effect of live wildlife snag replacement trees on managed stands was modeled using the concept of a limited biological potential for cubic foot volume growth of forest stands. We assumed that all managed yield strategies would maintain full site occupancy during their respective rotations. Competing vegetation may help to occupy sites early in the rotation. Cubic foot volume growth which accumulates on wildlife trees during their residence in managed stands is assumed to be unavailable to crop trees. This loss of cubic foot volume growth to wildlife trees is used as a measure of the competitive effect. The numbers and sizes of wildlife trees and their period of residence as live trees in managed stands were derived from the Deschutes Wildlife Tree Implementation Plan. Wildlife trees are modeled as occurring in small groups or clumps and growing at rates comparable to the PLT-PCT-FH silvicultural strategy. All managed yields are reduced in the FORPLAN model by the cubic foot volume growth of wildlife trees.

### (5) Volumes Reduced Due to Trees Left Standing in Retention Foreground and Spotted Owl Management Emphases

Four large trees per acre in ponderosa pine retention foreground areas are to be left standing at the end of each rotation to meet visual requirements. Ten trees will be left in mixed conifer spotted owl allocations. These trees will eventually die of natural causes and be retained as standing snags. For these areas the yield tables are predicting reduced total cubic volumes both from the leave trees, which will not be harvested, and from reduced growth of young trees in the new stand which are near enough to these large trees to compete with them. The suppression effect of these large trees on the new stand was modeled to show almost complete suppression within the area of crown closure of each large tree until its death, and no suppression beyond the area of crown closure. Crown closure percent for each large ponderosa was determined by using an HP-97 program developed by Don Wood of the Ochoco National Forest.

Probable age of mortality for ponderosa pine was projected from articles by Keen[5/] and Smith[6/]. The growth of the new trees growing in the "holes" left by the death of the large older trees was then modeled as if they received the same treatments at the same times as the surrounding stand.

The reduction in cubic foot volume due only to the effect of competition of the ponderosa pine leave trees on the understory is approximately 6 percent in PP Strata 1 and 9 percent in PP Strata 2. In the mixed conifer threatened and endangered species management emphases, the reduction due to the competitive effect of 10 overstory trees was 20 percent in Strata 1 and 19 percent in Strata 3.

(6) Defect

To reflect the losses in commercial volume due to defect, all thinning and final harvest entries in the managed yield tables were reduced by 5 percent.

(7) Nonstockable or Inoperable Openings

Since the MGDYLD5 base tables reflect 100 percent, or full stocking, it was necessary to make adjustments to account for small, unmapped nonstockable areas such as wet areas, rock outcroppings, landings, etc. For analysis areas which do not reflect special problems such as rocky areas, 5 percent was deducted from all yield table harvest entries to reflect nonstockable openings. In rocky soil analysis areas, a weighted average percent nonstockability for each District was calculated using a soils layer in the R2MAP data base. These reductions apply only to the rocky soil analysis areas on each District.

2. Recreation Supply and Consumption Coefficients

Estimates of both recreation supply (carrying capacity) and consumption were developed for each benchmark and alternative analyzed for the DEIS. The projected supply and consumption

[5/] F.P. Keen, "Longevity of Ponderosa Pine, Journal of Forestry" 38:597-598, 1940.

[6/] Tony Smith, "Longevity of Ponderosa Pine," Deschutes National Forest Technical Report, 1983.

trends were presented for each Recreation Opportunity Spectrum (ROS) category and Management Area. The estimates for these categories were also combined and summarized in terms of developed and dispersed recreation opportunities. This section will summarize the process used to develop the carrying capacity coefficients and consumption trends. A more detailed discussion can be found in the Forest Planning Document titled "Recreation Resource", and other process records in the Supervisor's Office.

The carrying capacity coefficients for each Management Area and ROS category were developed based on information from the 2309.13 Recreation Planning Handbook, the Recreation Inventory Management (RIM) database, and the code-a-site inventory data. From this information, it was possible to arrive at some theoretical per acre carrying capacities in terms of PAOT's/ acre for each category (PAOT stands for People At One Time). These were then converted to Recreation Visitor Days (RVD's)/ acre based upon information concerning season of use, pattern of use, and current relationships between RVD's and PAOT's. The general form of the equation was:

RVD's/acre = (PAOT's) * (Pattern and Season of Use)*(RVD/PAOT)

These coefficients multiplied times the number of acres in each respective Management Area allocation resulted in the derivation of the total Forest carrying capacity, or supply, for each Management Area and ROS category. These categories were then combined and summarized in terms of developed and dispersed recreation.

Also, a low and a high range of per acre carrying capacity coefficients were developed for each Management Area so that alternative levels of investment and their effects on recreation supply could be examined. However, the addition of these alternative recreation investment options created too many prescriptions for the FORPLAN Model. Instead of restricting the recreation options considered in order to fit within the FORPLAN model, the ID Team decided to analyze recreation supply and consumption outside the Model with an electronic spreadsheet.

The projections of recreation consumption trends were done somewhat differently. Historical and current use levels as portrayed by the RIM database were examined. The consumption trends generally appeared to be tied to the local and regional population trends. Based on this the Team decided to assume that future use trends would continue to reflect population trends projected by different organizations around the state (currently about 2 percent per year). Therefore, the supply coefficients and their respective acreage allocations were used to calculate a theoretical carrying capacity ceiling for each of the Management Areas and their respective ROS categories. The consumption trends for each category would be projected forward from current use levels until they reached the respective supply ceiling, at which time they would flatten out. One final assumption was made in making these projections. It was assumed that high levels of capital investment would also affect the slope of the projected consumption trends by enabling the Forest to capture a somewhat larger share of the recreation market, so that future use might increase by 2.5 percent per year instead of just 2 percent.

### 3. Wildlife Coefficients

Many of the wildlife related outputs and effects, such as projected species population levels, for each alternative were tracked outside the FORPLAN model. However, most of these estimates were based upon information derived from FORPLAN solutions. For example, a software program was developed to read a FORPLAN report file and generate special reports which portrayed the forest inventory by working group and successional stages throughout the planning horizon. From these reports, estimates of population levels for each key indicator specie could be developed. However, some wildlife outputs and effects were tracked within FORPLAN. We will summarize these in this section. For a more comprehensive understanding of the overall wildlife analysis process, refer to the Forest Planning Document titled "Wildlife Resource", and other process records in the Supervisor's Office.

Coefficients were developed for FORPLAN which were used to track the number of acres of habitat improvement in deer winter ranges, and bald eagle and spotted owl nesting areas. In deer habitat, each acre of precommercial thinning, prescribed burning, and regeneration harvesting was credited as an acre of habitat improvement. In the eagle and owl nesting areas, each acre thinning and regeneration harvesting contributed to the acres of wildlife habitat improvement.

Thermal cover was another output that was tracked and analyzed in FORPLAN. On acres which were allocated to the Deer Habitat Management Area, each ponderosa pine stand which had the neccessary crown closure characteristics was credited as an acre of thermal cover. The Model was used to schedule harvesting in such a way as to maintain the desired spatial relationships between cover and foraging areas.

Finally, acreage coefficients were developed for stands which classified as mature, over-mature, and old growth so that diversity and old growth requirements could be analyzed during the harvest scheduling process.

# IV. ECONOMIC EFFICIENCY ANALYSIS

This section describes the costs and benefits, as well as some concepts, involved in economic efficiency analysis, how they were derived, and how they were used in the Forest Planning process. Economic efficiency analysis is required by the National Forest Management Act Regulations (36 CFR 219) and played an important role in the development and evaluation of Forest Planning Benchmarks and Alternatives. Specifically, the Regulations (36 CFR 219.12(f)) state that:

> "The primary goal in formulating alternatives, besides complying with NEPA procedures, is to provide an adequate basis for identifying the alternative that comes nearest to maximizing net public benefits."

They followup in 36 CFR 219.12(F)(8) by stating that:

> "Each alternative shall represent to the extent practicable the most cost efficient combination of management prescriptions examined that can meet the objectives established in the alternative."

## A. Descriptions of Some Concepts Related to Efficiency Analysis

Before we get into the specifics of how economic efficiency analysis was used in the development of the Deschutes National Forest DEIS and Forest Plan, a few concepts and terms related to efficiency analysis in general need to be explained.

### 1. Priced Outputs (Benefits)

Priced outputs are those that are or can be exchanged in the market place. Their quantitative values are determined by actual market transactions or by estimation methods that produce prices commensurate with those determined by market transactions. Timber, forage, and minerals are examples of commodities which are bought and sold in the market. Their values are determined through the interaction of buyers and sellers based on the supply and demand conditions in the market at the time of the transaction. RVDs, on the other hand, are not normally exchanged via market transactions. Their market values are estimated by using some market transaction data in combination with various theoretical techniques. Conceptually, these assigned values should be consistent and comparable to those values which were actually derived via market transactions[1]. Therefore, both assigned and market values for priced outputs are appropriate to use for calculating quantitative measures of efficiency such as present net value.

2. Non-priced Outputs

Non-priced outputs are those for which there is no available market transaction evidence and no reasonable basis for estimating a dollar value commensurate with the market values associated with the priced outputs. In these cases, subjective non-dollar values must be attributed to their production. These values are qualitatively rather than quantitatively described. They may be either positive or negative. In fact, what may be considered to be a benefit to someone may represent a cost to someone else. Examples of nonpriced outputs include the maintenance or enhancement of threatened and endangered species, natural and scientific areas, historical and anthropological sites, visual quality, and clean air.

3. Discounting

Financial analyses of alternative investment options usually involves cash flows over different periods of time in the future. Inherently, there is a time value associated with money. Due to human propensity to consume now, a dollar today is worth more than a dollar 10 years from now. Discounting is a process for adjusting the dollar values of costs and benefits which occur at different periods in the future to dollar values for a common time period so that they may be compared. Usually the common time period is the present. In which case, the discounted cash flow is referred to as the present value.

4. Present Net Value (PNV)

Present net value is the difference between the discounted value (benefits) of all outputs to which monetary values or established prices are assigned and the total discounted costs of managing the planning area. The maximization of present net value was the criterion used to help ensure that each alternative was the most economically efficient combination of outputs and activities needed to meet the objectives established for that alternative. Present net value calculations consider only the benefits for which market prices exist or can be assigned. On the Deschutes, the priced benefits included timber, recreation, wildlife, special uses, and range. These were compared against all Forest Service fixed and variable costs associated with managing the planning area, regardless of whether they were incurred for the production of either priced or non-priced outputs, or as overhead expenses for general maintenance of the organization. Therefore, PNV is an estimate of the current market value of the priced forest resources after all costs of producing both priced and non-priced outputs and meeting other multiple-use objectives have been considered.

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[1] Rosenthal, Donald H. and Thomas C. Brown, Comparability of Market Prices and Consumer Surplus for Resource Allocation Decisions. Journal of Forestry, pp105-109, Feb 1985.

### 5. Opportunity Costs

Opportunity costs are defined as the value of a resource's foregone net benefit in its most economically efficient alternative use (FSM 1970.5). In relation to the economic analysis performed for Forest Planning, it represents the decrease in maximized PNV of an alternative or benchmark when some alternative level of resource outputs are forced into solution. Therefore, opportunity costs measure the change in PNV for priced resource outputs, and can be used to measure the relative value traded off in order to produce the non-priced benefits included in net public benefits.

### 6. Net Public Benefits (NPB)

The maximization of net public benefits is a goal of the Forest Planning process. Net public benefits is the overall value to the nation of all outputs and positive effects (benefits) less all the associated Forest Service inputs and negative effects (costs) whether they can be quantitatively valued or not. Net public benefits cannot be expressed as a numeric quantity because it includes qualitatively valued nonpriced outputs.

Conceptually, net public benefits is the sum of the present net value of priced outputs plus the full value of all non-priced outputs. The full value of non-priced benefits is used because the costs associated with their production is accounted for in the calculation of PNV. It is only necessary to identify the marginal values of non-priced outputs when management inputs are increased in order to provide these outputs at levels above current standards or legal requirements. In such cases, it is important to depict the physical, biological, and social dimensions of the non-priced outputs, as well as who will benefit and who will suffer from their production. Account should also be taken of any changes that may occur among the other non-priced outputs as a result of providing a particular non-priced output. In assessing the net public benefits of a particular alternative, it is necessary to judge whether the subjective value to society of its non-priced outputs exceeds the opportunity costs associated with their production.

### 7. Welfare Distribution Effects and Impacts

There is another level of effects which are also a concern of National Forest Policy and Management. These are the welfare distribution effects influenced by the mix and level of outputs produced by the National Forest. They can be either positive or negative. Their impacts can also be local, regional, or national in scope. Some distributive effects such as changes in consumer prices or taxpayer costs have national level impacts. Others, such as induced jobs and income, or payments in lieu of taxes are more local or regional in nature. They are more related to questions of equity (ie. who pays and who benefits) rather than efficiency. They are not assessed in the context of the efficiency criteria associated with the PNV and net public benefit concepts. However, these positive and negative distributive effects need to be assessed in conjunction with the net public benefit measures since equity objectives often influence efficiency objectives and vice versa. These will be discussed in more detail in Section V.

## B. Parameters and Assumptions Used For Economic Efficiency Analyses

In order to calculate the present net value for each alternative, several assumptions had to made regarding discount rates, demand curves, real dollar adjustments, and real price and cost trends. This section will summarize these decisions and their resulting parameters. A more detailed discussion can be found in various process records in the Supervisor's Office.

### 1. Discount Rates

Discounting requires the use of a discount rate which is an interest rate that represents the cost or time value of money in determining the present value of future costs and benefits. Two discount rates were used to calculate the present net values for each benchmark and alternative. Both of them were real discount rates meaning that they were adjusted to exclude the effects of inflation (Real dollar adjustments will be discussed more below). According to FSM 1971.71:

> For evaluations of long-term investments and operations in land and resource management in the 1980-1985 planning period, a 4-percent real discount rate shall be used. Evaluations should also discount benefits and costs at the real discount rate used in the most recent RPA to determine sensitivity of alternatives to variations in the discount rate.

The 4-percent rate approximates the "real" return on corporate long-range investments above the rate of inflation[2]. The 4 percent rate was used to solve FORPLAN and calculate the PNV for each benchmark and alternative. The 1985 RPA program used a real discount rate of 7-1/8 percent. An analysis of the sensitivity of the Preferred Alternative to the discount rate was performed by solving FORPLAN using both the 4 percent and the 7-1/8 percent discount rates. For all other benchmarks and alternatives, the present net values were merely recalculated using this second discount rate (FSM 1971.71). Finally, all costs and benefits were discounted from the midpoint of the decade in which they were incurred.

2. Demand Curves and Real Price Trends

As specified by the Washington Office (1920 letter to Regional Forester, "Downward Sloping Demand Curves", 2/3/81) and in keeping with FSM 1971.65, horizontal demand curves for timber and nontimber resources were used to analyze the benchmarks and alternatives for the DEIS. Many factors can influence the demand for stumpage off of any one forest[3]. Some of these factors include trends in (1) interest rates, (2) the species and products mix of forest products consumption, (3) use of wood for energy, (4) forest products exports, (5) the cost of wood in Canada, (6) the rate of technical improvements in wood and fiber processing, and (7) the levels of other national forests harvests. All of these contain some degree of uncertainty regarding their future states of nature. Neither the empirical nor the theoretical bases have been well enough developed to derive reasonable estimates of the demand functions for the resources offered at the Forest level. Evidence does exist, however, that suggests that the elasticity in the portion of the timber demand curve for which the Forest can influence output levels is such that prices would be relatively insensitive to some "reasonable" range of quantity offerings. In other words, it appears that the timber demand curve for the range of ouput levels analyzed during the development of alternatives is nearly horizontal.

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[2] Row,Clark, H.Fred Kaiser, and John Sessions, Discount Rate for Long-Term Forest Service Investments. 1981

[3] Adams, Darius M., and Richard W. Haynes, "Changing Perspectives on the Outlook for Timber In the United States", Journal of Forestry, January 1985.

As a surrogate for resource demand curves, real price trends were developed and used to represent the rate at which resource values will change over time as a result of anticipated supply and demand interactions in the market place. As specified by the Regional Office (1920 letter to Forest Supervisors, "Timber Price Trends, Values, and Costs", 9/25/84), a 1 percent per year real price trend for stumpage was used for FORPLAN harvest scheduling analyses. These were applied for the first 50 years, and then a 0 percent price trend was assumed for the remaining 100 years of the harvest scheduling planning horizon. These imply that nominal stumpage prices (ie. those which include the effects of inflation) will increase during the next 50 years at a rate of 1 percent greater than the rate of inflation, and equal to rate of inflation from there on after.

Since price trends are reflections of expected futures, there is an inherent uncertainty involved with making such projections. In recognition of this uncertainty, we performed a sensitivity analysis by rerunning RUN-3 of the benchmarks using alternative stumpage price trends of 0,2, and 3 percent. The results of these runs are quite complex and are discussed in detail in the Forest Planning Document titled "A Summary of the Analysis of the Management Situation". Generally, higher price trends make silvicultural investments economically more attractive, but they also tend to result in the substitution of lower valued species for higher valued species in sale offerings during the early decades since it pays to hold the higher valued timber on the stump as far as maximizing PNV is concerned.

Based on Washington Office direction, a 0 percent real price trend for all other resources was used during the development of the benchmarks and the alternatives. In other words, their future nominal values will change at rates equal to inflation.

### 3. Real Cost Trends

Based on Washington Office direction, 0 percent real cost trends were used for all future costs used in the development of the benchmarks and alternatives. In other words, the costs of labor, fuels, materials, and all other factors of production involved with managing the Forest are assumed to change at a rate equal to the rate of inflation.

### 4. Real Dollar Adjustments

Future prices and costs can be expressed in both nominal and real terms. The projection of nominal values includes the effects of inflation on these values. The projection of real values does not. For example, assume that the future prices for commodity XYZ are projected to increase annually by 8 percent. Also assume that the rate of inflation is anticipated to be 5 percent. In real terms, the prices are increasing by only 3 percent per year above and beyond the rate of inflation. Real value changes are the result of the interactions of supply and demand forces in the market place. They do not include the effects of inflation.

All future values and costs used in the Forest Planning process were expressed in real 1982 dollars, consistent with the 1985 RPA program. The GNP implicit price deflator index was used to convert both historical and future nominal prices and costs to this common base (FSM 1971.32b).

## C. Costs Used for Economic Efficiency Analyses

This section describes the costs used to perform economic efficiency analysis for each of the benchmarks and alternatives considered during the development of the DEIS.

All Forest Service costs were included for purposes of estimating budgets and calculating present net values for each alternative. These costs were identified by their Management Information Handbook (MIH) codes as described in FSH 1309.11. The MIH activity descriptions and their associated codes were useful for identifying how different costs would be treated during the plannng process. At the outset, each cost was categorized as either a fixed or a variable cost. If it was identified as a variable cost, decisions were made as to whether it would be analyzed in FORPLAN, TRANSHIP, or some form of electronic spreadsheet. Costs were determined by examining: (1) the PAMARS database, (2) Advent RPA budget planning files,(3) historical records and contracts, and (4) the results of time-motion studies. Professional judgement was also an important factor when it came to making assumptions regarding what bearing historical costs had on anticiapted future costs. All costs were developed and reviewed by the Forest Economist and the appropriate staff and sub-staff personnel. In the following discussion, we will summarize the cost breakdowns and how they were incorporated into the efficiency analyses for each alternative. A more detailed presentation of the specific costs and their functions in the analytical tools can be found in the process records at the Supervisor's Office.

### 1. Costs Considered to be Fixed Across Alternatives

A cost was classified as "fixed" if it: (1) was not expected to vary significantly over the range' of alternatives considered, (2) could not be tied to specific activities within any of the prescriptions, (3) represented a very small and insignificant amount of the Forest budget, (4) had insufficient cost records to support assumptions about when or how much it would vary as different prescriptions were implemented, and (5) was not related to the production of outputs and effects which were relevant to addressing the Forest Planning ICOs. Fixed costs were a component of the budget estimates and present net value calculations for each alternative.

Table B-IV-1 below lists the MIH codes and their associated activities that were considered as "fixed" costs across all alternatives developed for the DEIS. These costs may vary over time, but they do not vary between the alternatives. The "percent of budget" calculations were based on the tentative 1986 budget proposal.

Table B-IV-1 MIH Codes and Activities Considered As Fixed Costs

| MIH Code | MIH Activity Description | % of Est. 1986 Budget |
|---|---|---|
| A01/312 | Visual Condition Inventory | .02 |
| B01 | Wilderness Planning | .02 |
| D04 | Range Non-Struct. Improvement Maintenance | .02 |
| D08 | Ecosystems Description & Inventory | .27 |
| E00 | Timber Resource Planning & Inventory | .41 |
| E08 | Nursery Management | .33 |
| E10 | Nursery Expansion | .00 |
| F01 | Soil and Water Inventory | .09 |
| F02 | Soil and Water Planning | .12 |
| F03 | Soil and Water Improvements | .13 |
| F04 | Soil and Water Admin. and Management | .20 |
| F08 | Soil and Water Resource Improvement/Maint. | .08 |
| G01 | General Technical Inventory and Evaluation | .02 |
| G07 | Contest, Hearings, and Appeals | .01 |
| G08 | Reserved and Outstanding Rights | .01 |
| H07 | Other Human Resource Programs | .39 |
| J02 | Rights-of-Way-Grants for Roads & Trails | .05 |
| J03 | FERC License & Permits | .02 |
| J04 | Withdrawals, Modifications, Relocations | .02 |
| J09 | Other Land Title Claims | .02 |
| J10 | Encroachment | .02 |
| J11 | Land Ownership Planning | .00 |
| J12 | Land Adjustment Planning | .01 |
| J14 | Land Exchange-Cash Equalization | .03 |
| J16 | Land Transfers | .00 |
| J17 | Landsales, Grants, Selections | .03 |
| J22 | Land Management Planning | .49 |
| L24 | FA&O Construction and Reconstruction | 1.31 |
| L25 | FA&O Facility Maintenance | .33 |
| P01 | Fire Management Planning & Analysis | .11 |
| P03 | Fire Detection | .29 |
| P04 | Primary Attack Forces | 5.23 |
| P05 | Secondary Attack Forces | .03 |
| P14 | Fuel Treatment Area Maintenance | .01 |
| P19 | Aerial Transportation of Persons | 3.87 |
| P20 | Aerial Transportation of Goods | .03 |
| P21 | Aerial Application of Materials | .90 |
| P22 | Aerial Platforms | .33 |
| P25 | Coop Law Enforcement | .20 |
| T01 | Line Management | .99 |

Total Fixed Costs as a % of Est. 1986 Budget = 16.48%

## 2. Costs Considered to be Variable Across Alternatives

All other costs were classified as "variable". These costs were tied to the implementation of activities within a Management Area Prescription, and were expressed as costs per acre or costs per unit of output (ie. dollars per MCF, dollars per RVD, etc.). Variable costs were analyzed either in FORPLAN, TRANSHIP, or some form of spreadsheet.

In general, FORPLAN contained all of the variable costs associated with implementing multiple use vegetative management activities, and the initial collector road construction costs incurred to access roadless areas. It also contained some non-federal logging costs for those analysis areas requiring more expensive logging shows than the average tractor logging costs which were used to derive the stumpage values for the Model. These non-federal costs were included in FORPLAN's PNV calculations, but did not influence the Forest Service budget estimates. Table B-IV-2 depicts the variable Forest Service costs that were included in FORPLAN and contributed to its calculation of PNV for alternative multiple use timber harvest scheduling solutions.

Table B-IV-2 Variable Costs

| MIH CODE | MIH ACTIVITY DESCRIPTION | % OF EST. 1986 BUDGET |
|---|---|---|
| AZ9 | Recreation Support to Other Resources | .32 |
| CZ9 | Wildlife Support to Other Resources | .51 |
| DZ9 | Range Support to Other resources | .19 |
| E03 | Field Data Collection | 1.14 |
| E04 | Reforestation | 13.67 |
| E05 | Timber Stand Improvement | 4.72 |
| E06 | Timber Sale Prep | 5.98 |
| E07 | Timber Harvest Administration | 3.24 |
| FZ9 | Soil, Water, and Water Support | .22 |
| GZ9 | Lands Support to Other Resources | .01 |
| L01-L50 | Arterial, Collector, & Local Road Const. | 15.59 * |
| P11 | Treatment of Fuels | 6.82 |
| P24 | Law Enforcement | .27 |

FORPLAN Variable Costs as a % of 1986 Budget = 37.09-52.69%

* These costs pertain to the total Forest. The cost in FORPLAN would be less than this since it only includes the new construction costs for inventoried roadless areas. This is reflected in range of totals presented for this table.

Table B-IV-2 lists the MIH activity codes for which costs were developed and entered into FORPLAN. Since Version I of FORPLAN does not easily track its activities by individual MIH codes, many of these elements were combined into broader FORPLAN cost categories. These costs were usually expressed in terms of dollars/acre or dollars/MCF. The costs which were expressed in units of volume were also developed by diameter classes. This was true for both the marginal non-federal logging costs, and the sale preparation/administration costs. For each FORPLAN cost category, a range of costs were entered into the model based on the Management Prescriptions, and the characteristics of the analysis areas to which they applied. All in all, 299 different FORPLAN economic tables were developed to cover the differnent cost and value combinations to which prescriptions could be assigned in the Model. Table B-IV-3 presents some broad FORPLAN cost categories, the units for which the costs were based, and the range of costs included in the Model.

Table B-IV-3 FORPLAN Cost Categories

| FORPLAN General Cost Category | Units | Cost Range |
|---|---|---|
| Site Preparation | Per Acre | $140 - $325 |
| Reforestation | Per Acre | $5 - $660 |
| Brush Release | Per Acre | $16 - $70 |
| Precommercial Thinning | Per Acre | $70 - $300 |
| First Entry Road Construction | Per Acre | $93 - $335 |
| Sale Prep. & Admin (Thinnings) | Per MCF | $26 - $343 |
| Sale Prep. & Admin (Final Harvest) | Per MCF | $7 - $202 |

The TRANSHIP model was used to determine the least cost transportation network needed to serve the timber and recreation traffic loadings for each alternative. It was run with five decades worth of timber and recreation traffic loadings on its network nodes and a least cost objective function. TRANSHIP dealt primarily with the costs associated with the L01 through L50 MIH activity codes. Since FORPLAN contained the initial capital investment costs for new road construction in the inventoried roadless areas, TRANSHIP was primarily used to analyze the truck and car traffic patterns, and the associated operations and maintenance costs for the network as a whole. The discounted costs from TRANSHIP were a component of the present net value calculations for each alternative.

All of the other identified variable costs were analyzed outside of these two models with the use of spreadsheets. In the case of recreation, the capital investment, and the operations and maintenance costs were directly related to the resulting recreation allocations and projected RVD consumption trends for each alternative. The electronic spreadsheet did what FORPLAN would have done but couldn't due to its size limitations and the team's desire to examine a wide range of prescription choices for both the timber and the recreation resources. With recreation being evaluated outside of FORPLAN, efficiency analysis was a little more cumbersome--sometimes requiring iterative examinations with both analytical tools. But the spreadsheet gave the ID Team more flexibility to examine alternative recreation management options for each alternative. As we further refine the joint production relationships between timber and recreation, and as we get better handles on the economic worth of recreation, the more desirable it will be to analyze the tradeoffs between these two important resources in one integrated model.

The range capital investment, and operations and maintenance costs were a function of the amount of outputs and emphasis a particular benchmark or alternative was designed to provide for this resource, rather than a result of a particular land allocation. Range was dropped from FORPLAN due to its relative insignificance to the Forest's present net worth (less than 1 percent), and the increased model size that would have been necessary to carry the range allotments as analysis area identifiers. When range was included in our earlier FORPLAN formulations, it appeared to have little effect on the timber harvest scheduling solutions. With or without range in the model, the timber prescriptions selected usually included intensive silvicultural regimes.

The remaining identified variable costs that were not related to the range and recreation programs were also evaluated outside of the model. It was evident that these costs should vary between alternatives. Generally, it appeared that these activities and their associated costs should vary as a function of land allocations, timber management activities, resource output levels, or road and facility development activities. However, due to the very soft data regarding the per unit costs of many of these activities, and the uncertainty as to the exact nature of their production relationships, the Team decided to examine them outside of FORPLAN. Basically, the costs associated with these activities were estimated by comparing the amounts of relevant allocations or activity levels in a particular alternative to the current direction and indexing the projected costs based on those relationships. Again, as our management accounting databases improve, and as we learn more about the production relationships of these activities, it would be desirable to incorporate these into one integrated resource allocation and scheduling model.

Table B-IV-4 Other Variable Costs

| MIH Code | MIH Activity Description | % OF EST. 1986 Budget |
|---|---|---|
| A01 | Recreation Planning | .18 |
| A02/308 | Cultural Resource Inventory | .47 |
| A03 | Cultural Resource Evaluation | .02 |
| A03 | Cultural Resource Protection & Enhancement | .11 |
| A05 | Facility & Site Reconstruction | .66 |
| A06 | Facility & Site Construction | .38 |
| A07 | Facility & Site Management | 4.82 |
| A08 | Use Administration | .43 |
| A10 | Trail Reconstruction | .13 |
| A11 | Trail Construction | .10 |
| A12 | Trail Operation & Maintenance | .36 |
| B03 | Wilderness Use Administration | .27 |
| C01 | Surveys, Planning, Prescriptions, Monitoring | .34 |
| C02 | Non-structural Habitat Improvements | .56 |
| C03 | Structural Habitat Improvements | .03 |
| C04 | Structural Habitat Improvements Maintenance | .11 |
| D01 | Range Resource Planning | .06 |
| D02 | Range Resource Inventory | .08 |
| D03 | Range Non-Structural Improvements | .02 |
| D05 | Range Structural Improvements | .18 |
| D07 | Range Administration & Management | .35 |
| E09 | Genetic Tree Improvement | 1.02 |
| F09 | Monitoring | .14 |
| G02 | Site Specific Technical Investigations | .14 |
| G03 | Processing of Exploration Proposals | .04 |
| G04 | Processing of Lease Applications | .04 |
| G05 | Processing of Site Specific Dev. Proposals | .15 |
| G06 | Administration of Operations | .13 |
| J01 | Special Use Management | .24 |
| J06 | Property Boundary Locations | 1.28 |
| J07 | Property Boundary & Corner Maintenance | .03 |
| J13 | Land Exchange | .15 |
| J15 | Land Acquisition | 1.32 |
| J18 | Rights-of-Way Acquisition | .04 |
| J19 | Rights-of-Way Cost Share Agreements | .05 |
| P02 | Fire Prevention | .11 |
| P06 | Fire Reinforcements | .07 |
| P07 | Forest Fire Support & Facilitating Services | 3.43 |
| P10 | Fuels Management Inventory | .02 |
| P12 | Treatment of Natural Fuels | .11 |
| P24 | Law Enforcement | .27 |
| T02 | Program Support | 3.96 |
| T03 | Common Services | 1.69 |

Other Variable Costs as a % of 1986 Budget = 30.83%

## D. Benefits Considered for Economic Efficiency Analyses

This section describes both the priced and non-priced benefits which were incorporated in the economic efficiency analyses for each benchmark and alternative considered during the development of the DEIS.

Resource outputs to which dollar values were assigned constitute the priced benefits included in the present net value calculations. Like all of the costs included in the analyses, only those benefits incurred during the 50 year RPA planning horizon were incorporated in the PNV calculations. The economic efficiency analysis for each alternative also considered non-priced benefits. These are outputs for which there is no available market transaction evidence and no reasonable basis for estimating a dollar value commensurate with the market values associated with the priced outputs. In these cases, a subjective qualitative value must be attributed to their production. Conceptually, the addition of the non-priced benefits to PNV is used to derive the net public benefits associated with each alternative. Both priced and non-priced outputs and their associated values will be summarized below. More detailed documentation of the specific values and the process used to develop them can be found at the Supervisor's Office.

### (1) Priced Benefits Considered for Economic Efficiency Analysis

Priced benefits fall into one of two categories: market and nonmarket (assigned). The market values constitute the unit price of an output normally exchanged in a market after at least one stage of production, and are expresed in terms of what people are willing to pay as evidenced by market transactions. Nonmarket values constitute the unit price of a nonmarket output not normally exchanged in a market at any stage before consumption, and thus must be imputed from other economic information (FSM 1970.5). They are valued in terms of what reasonable people would be willing to pay (above participation costs) rather than go without the output. In either case, their values are theoretically commensurate and appropriate for inclusion in PNV calculations. The resources for which dollar values were estimated on the Deschutes consisted of timber, range, special uses, and developed, dispersed, and wildlife oriented recreation.

Timber was the only resource to which market prices were assigned in FORPLAN. These values were expressed in terms of dollars/MCF paid at time of harvest. The stumpage prices were developed for both existing natural and future managed stands, and were working group (PPN, LPP, MC, and MH) and diameter class (4 inch DBH intervals) specific.

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The process for calculating the stumpage values was quite complex. We will summarize it here. All calculations were performed in terms of constant 1982 dollars. Also, since most of the source data was expressed in terms of dollars/MBF, it was necessary to convert these to dollars/MCF at different steps in the process. The stumpage values were first calculated for each individual species, and then converted to working group stumpage prices based on the species composition of each working group modelled in FORPLAN. Also, since none of the source data was diameter specific, assumptions had to be made regarding the average diameter of trees sold for each species during the period for which the data sources covered. The diameter specific values and costs were then developed based on diameter class relative indices for lumber selling values, logging and manufacturing costs.

The first step was to calculate the stumpage price at time of harvest by examining Cut & Sold Report data files for the years 1977 through 1982. Next, logging and manufacturing costs were estimated based on a statistical analysis of 2400-17 Timber Sale Report data files for the years 1972 through 1982. The resulting logging and manufacturing costs, and the profit margin were then added to the average stumpage price in order to arrive at the average lumber selling value. All of this was done for the average diameter class of trees sold for each species during the period of time covered by the source data.

Based on work done at the Pacific Northwest Forest and Range Experiment Station, lumber selling price diameter relationships were used to develop diameter specific lumber selling values. Logging cost diameter relationships based on available time-motion studies done in the Pacific Norhtwest were then used to develop the diameter specific logging costs. Manufacturing costs and profit margins were also calculated for each diameter class for each species. The remaining step was to then derive the stumpage values for each diameter class by deducting the respective diameter specific profit margins and processing costs from the selling values.

After converting these species stumpage prices to working group stumpage prices, the next step was to enter them into FORPLAN. One final adjustment needed to be made. The logging costs used to derive the stumpage values pertained to tractor logging. For the less than 10 percent of the analysis areas which required more expensive logging shows, the stumpage values were adjusted to reflect the higher marginal logging costs.

Table B-IV-5 below presents the diameter specific working group stumpage values based on tractor logging systems.

Table B-IV-5 Working Group Stumpage Values ($/MCF)

| DBH Class | PPN | LPP | MC | MH |
|---|---|---|---|---|
| 8.0-9.9 | 30 | 31 | 35 | 30 |
| 10.0-11.9 | 37 | 43 | 45 | 35 |
| 12.0-13.9 | 295 | 212 | 180 | 38 |
| 14.0-15.9 | 604 | 413 | 423 | 119 |
| 16.0-17.9 | 733 | 470 | 541 | 159 |
| 18.0-19.9 | 881 | 532 | 657 | 191 |
| 20.0-21.9 | 981 | na | 746 | 222 |
| 22.0-23.9 | 1113 | na | 840 | 240 |
| 24.0-25.9 | 1197 | na | 901 | 257 |
| 26.0-27.9 | 1257 | na | 944 | na |
| 28.0-29.9 | 1315 | na | 982 | na |
| 30.0+ | 1391 | na | 1028 | na |

All other priced benefits were analyzed with electronic spreadsheets outside of FORPLAN. As discussed earlier, this sometimes required some iterative analyses between FORPLAN and the spreadsheets to ensure that in fact the solution for an alternative reasonably approximated the most economically efficient set of prescriptions and outputs to achieve the objectives of a particular alternative. A description of the other priced outputs follows.

The range outputs represent the amounts of forage permitted to be grazed and is measured in units of animal unit months (AUMs). AUM values were calculated as the value of the marginal product of an AUM in the production of a marketable animal. The Forest Service entered into a cooperative agreement with the USDA Economic Research Service to develop livestock enterprise budgets for each National Forest. The Range Budget Approach was used for this analysis. Because Forest AUMs are not actually priced in a free competitive market, the calculated price is an estimate of market value. First, returns from all ranch products were determined. Then, all costs of production were subtracted. The remaining returns plus the cost of the Forest Service permits became the residual value of the AUM. This residual value of an AUM to ranch livestock production is comparable to conversion surplus timber values. Based on the information provided in the RPA 1985 Program analysis for the DEIS, and a Regional Office Memmo (2340, 9/30/83), the AUM value for the Deschutes National Forest in 1982 dollars is $10.73.

The non-wildlife related recreation and wilderness outputs represent the amount of use consumed on the Forest and are measured in terms of recreation visitor days (RVDs). The wildlife related recreation use is measured in terms of wildlife and fish user days (WFUDs). The values used for these priced outputs were derived directly from the 1985 RPA program assessment. This discussion is a summary of the write-up found in Appendix F the 1985 RPA DEIS.

The development of recreation, wilderness, and wildlife values for the 1985 RPA Program analysis consisted of two steps: (1) development of recreation and wildlife benefit values by activity per RVD or WFUD; and (2) adjustment of values to reflect standard and less than standard levels of management.

The Resource Evaluation Group at the Rocky Mountain Forest and Range Experiment Station conducted an extensive literature search to develop the 1985 activity values for recreation. Benefit values for recreation, wilderness, and wildlife activities were developed from recent travel cost models and contingent valuation research.[4] In-service and academic specialists reviewed the research and activity values and adjusted the initial values to achieve methodological consistency to apply them to regional conditions. The values represent total willingness to pay for an aditional recreation site, herd unit, or wilderness area. The RVD values by recreation activity that were generated by this study can be found in Table F.4 of the 1985 RPA DEIS.

For program evaluation purposes, these values were subsequently adjusted downwards because:

-- The travel cost method represents a total willingness-to-pay. Other resource values in the RPA evaluation represent market price or value of the marginal product. Consequently, the willingness-to-pay values were adjusted in an effort to make the recreation values more compatible with values used for other resource outputs.

-- The travel cost method estimates values on a site-by-site basis. The method does not address the question of whether regionally or nationally a given quantity of RVDs will, in fact, be consumed if that price were changed.

-- It is believed that the travel cost studies are typically done at higher quality sites, do not take into account substitutes to individual sites, and do not accurately measure trip length; consequently, values from these studies may be on the high side when applied to average situations on a region-wide basis.

In response to the first concerns, the values were adjusted based on the relationship between the proportion of recreation provided by the Forest Service and estimates of an average nationwide demand elasticity for outdoor recreation. It is estimated that nationally, roughly a 5 percent increase in price will result in a 1 percent decrease in quantity demanded.[5] It is also estimated that in 1982 the Forest

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[4] Loomis, John and Cindy Sorg. A Critical Summary of Empirical Estimates of the Values of Wildlife, Wilderness, and General Recreation Related to National Forest Regions. Rocky Mountain Forest And Range Experiment Station, USDA Forest Service, 1982.

[5] Lewis, Robert C 1977, "Policy Formation and Planning for Outdoor Recreation Facilities." Pages 62-69 of Outdoor Recreation - Advances in Application of Economics" by Jay M. Hughes and R. Duane Lloyd, USDA, Forest Service, General Technical Report WO-2.

Service provided 7.5 percent of all outdoor recreation. Consequently, it is roughly estimated that there will be a 5 percent decrease in price for each percent of the 7.5 percent Forest Service market share or a total decrease of 37.5 percent for clearing the market. Therefore, the initial willingness-to-pay values were reduced 37.5 percent for use in comparing resource allocation choices.

In response to the quality factor, the concept of standard and less-than-standard service was introduced, and the resulting impact on the value of the experience to the recreationist was estimated. If recreation facilities are not fully maintained, the quality of the experience will be lowered. Two different sets of values were developed to account for the standard and less-than-standard outputs. A special study showed that on the average the less-than-standard RVDs are valued at about 53 percent of the value of standard RVDs. Accordingly, different capital investment, and operations and maintenance costs were developed for the standard and less-than-standard recreation outputs. Depending in the theme of an alternative, assumptions had to be made as to which standard the recreation resources would be managed to provide.

Finally, these values were expressed in terms of the recreation opportunity spectrum (ROS) activity categories in accordance with the way they were developed and tracked during the process of analyzing alternatives. The resulting values are depicted in Table B-IV-6.

Table B-IV-6 1985 RPA Recreation Benefit Values (1982 $)

| Recreation | Value($/RVD) |
|---|---|
| Primitive (STD) | 11.25 |
| Primitive (LSTD) | 5.96 |
| Semi-Primitive Non-Motorized (STD) | 13.25 |
| Semi-Primitive Non-Motorized (LSTD) | 7.02 |
| Semi-Primitive Motorized (STD) | 12.13 |
| Semi-Primitive Motorized (LSTD) | 6.43 |
| Roaded Natural (STD) | 9.38 |
| Roaded Natural (LSTD) | 4.97 |
| Rural (STD) | 8.47 |
| Rural (LSTD) | 4.49 |
| Urban (STD) | 11.38 |
| Urban (LSTD) | 6.03 |

| Wilderness | Value($/RVD) |
|---|---|
| Primitive (STD) | 17.50 |
| Primitive (LSTD) | 9.28 |
| Semi-Primitive Non-Motorized (STD) | 17.50 |
| Semi-Primitive Non-Motorized (LSTD) | 9.28 |

| Wildlife & Fish | Value($/WFUD) |
|---|---|
| Big Game | 30.00 |
| Nongame | 25.00 |
| Resident Fish | 15.00 |
| Other Game | 19.00 |
| WL/F REC (STD) | 21.00 |
| WL/F REC (LSTD) | 14.00 |

Finally, both recreation and non-recreation special uses were included as priced outputs for the calulation of PNV. The receipts for these activities were based on the actual cash transactions for the years 1980 through 1984. While the recreation uses account for the bulk of the special use fees, these receipts in general are a very small percentage of the total Forest revenues. For each alternative, their projections are a function of estimated downhill skiing use at Mt. Bachelor since this is the primary contributor to special use revenues.

### (2) Non-Priced Outputs Considered in Economic Efficiency Analysis

The calculation of PNV enables the comparison of alternatives with regards to their output levels for priced resources, and their efficiency in producing them. However, other factors also influence the decisionmaking process. In some cases, the importance of non-priced benefits for which it is impossible to assign monetary values can outweigh the advantages of producing higher levels of priced outputs. The importance of the need to consider these subjectively valued benefits in Forest management decisionmaking is addressed in the NFMA Regulations which charge the Forest Service with identifying the alternative which comes nearest to maximizing net public benefits (36 CFR 219.12(F)).

Net public benefits (NPB) represent the overall value to the nation of all outputs and positive effects (benefits) less all associated inputs and negative effects (costs), whether they can be quantitatively valued or not (36 CFR 219.3). Net public benefits include both priced and nonpriced resource outputs, less all costs associated with managing the area. As stated earlier, all priced outputs and all costs associated with managing the Forest are included in the calculation of PNV. To this, the net subjective values of the non-priced outputs must be added in order to arrive at the overall NPB of an alternative. Some of the most important non-priced benefits addressed during the Deschutes National Forest planning process revolve around maintaining and enhancing the following:

(a) Lifestyles
(b) Diversity and Quality of Recreation Opportunities
(c) Suitable Habitat for Threatened & Endangered Species
(d) Ecosystem Diversity
(e) Visual Quality
(f) Historical and Cultural Resources
(g) Water Quality
(h) Air Quality

These are all outputs and effects which are influenced to a large degree by decisions regarding how to manage the Forest. They are all the topic of one or more issues and concerns which were identified at the outset of the planning process. So they are important, but it is not possible to measure ther importance in dollar terms which are comparable to market values. Their values must be subjectively determined.

The provision for many of the non-priced benefits is achieved by applying constraints to the production of priced outputs (ie. such as timber harvesting constraints in FORPLAN). These constraints usually result in a decrease in the PNV of the priced outputs to which the constraints were applied. Subjective judgments are then necessary in assessing whether the benefits of producing the non-priced outputs exceed the opportunity costs associated with producing fewer priced outputs. If a PNV tradeoff induced by the provision of a non-priced output is judged acceptable, then a positive contribution to NPB has resulted, and the alternative is overall more efficient.

The non-priced outputs considered during the development and evaluation of alternatives are discussed below. While the quantitative dollar values of each can not be determined, they can generally be evaluated by examining such quantitative indicators as acres of appropriate allocations, resource inventories, or timber production related activities and outputs.

(a) Lifestyles - Surveys of the Central Oregon populus have shown that many people are attracted to the area for the outdoor lifestyles it can offer them. While this is not to say that jobs and income are not important, many have indicated that their choice to live here was made at the expense of economic interests. A Forest with a broad recreation base in a pleasing environment could be an asset to the Central Oregon area while still providing goods and services necessary for stable Forest based economies.

Central to maintaining and enhancing the Central Oregon lifestyle is the provision of diverse recreation opportunities, and clean air and water to enjoy them. The freedom and ability to cut personal use firewood is also important. To the extent that an alternative results in reduced or less diverse recreation opportunities, lower quality water, smokier air, or more restrictive access to personal use firewood, the alternative will be less desireable from a lifestyle point of view. Many of these effects are directly related to land allocations and resource management goals which emphsize the production of wood at the expense of amenity values.

The stability of jobs and income in the area is also an element of the concern about lifestyles. For this purpose, each alternative was analyzed with regards to its potential impacts on jobs and income in Deschutes County (Refer to Section V). Any indications that the implementation of an alternative would result in fewer jobs and less income would be considered disruptive of the current lifestyles.

(b) Diversity and Quality of Recreation Opportunities - The number of recreation visitor days and their associated priced values are included in the PNV calculations for each alternative. However, the assigned dollar values per RVD do not reflect the value of providing a diversity of recreation opportunities and settings. The Forest currently provides adequate recreation diversity as indicated by the reasons many people choose to live and recreate in the area. However, some aspects of the recreation opportunity spectrum are becoming more difficult to retain. For example, as remaining roadless areas are either designated as wilderness, or roaded and developed for other uses, there are fewer opportunities for the semi-primitive and primitive recreation experiences outside of wilderness areas. Related to this is the idea that as more and more roadless areas are either developed or designated as wilderness, future generations will have fewer options regarding how to best manage them to meet changing needs. To the extent that retaining roadless areas in undeveloped conditions does not overly restrict the efficient production of priced outputs, both the recreation diversity and the future options which they offer are considered a non-priced benefit. For each alternative, the recreation allocations and projected carrying capacitys are categorized according to the recreation opportunity spectrum. This will be used to assess the recreatiom diverstiy which an alternative provides.

(c) Suitable Habitat for Threatened & Endangered Species - The threatened, endangered, and sensitive wildlife species managed on the Forest include bald eagles and northern spotted owls. Each alternative provides for at least enough habitat to satisfy the Minimum Management Requirements (MMRs) for each of these species. However, some alternatives provide habitat for these species in excess of the MMRs. Any provision of suitable habitat in excess of the MMRs is considered to be a non-priced benefit.

(d) Ecosystem Diversity - Maintaining plant and animal ecosystem diversity over time is also considered as a non-priced component of net public benefits. Benefits generally associated with ecosystem diversity are gene pool maintenance, scientific research opportunities, and the reduction of insect and disease risks. Since animal diversity is to a large extent dependent upon plant diversity, attention is focused particularly on the number of acres for each working group in each successional stage. The amount of old growth provided is especially important since this component would be the most difficult to replace once it disappears. It serves as the focus for evaluating each alternatives impact on ecosystem diversity. Timber harvesting and fire are the chief means of manipulating vegetative diversity. The effects of scheduled timber harvesting on vegetative diversity were evaluated through a combination of FORPLAN reports and some special software programs which were developed specifically for that purpose. The risks of wildfire were also examined for each alternative. To a certain extent, the more old growth provided for in a particular alternative, the higher the benefits associated with this non-priced output.

(e) Visual Quality - While the value of visual quality is not directly included in the PNV calculations, its value is indirectly represented through the consideration of recreation as a priced benefit. It is safe to assume that the provision of positive visual experiences has a direct relationship to the quantity and quality of recreation on the Forest. However, a large number of people who benefit from the visually appealing scenery are not tallied as recreation users of the Forest. For example, there are two principal highways which pass through the Forest. The people who drive on these pass through some quality scenic areas. Yet, they are not counted as RVDs. There are also the people who live in or around the Forest who everyday enjoy scenic qualities associated with the forested mountain environment. Again, these beneficiaries are not tallied as RVDs. These benefits are nonmeasureable.

The alternatives each vary in their emphases to satisfy visual quality objectives. This can be measured in terms of the percentage of all sensitive retention and partial retention visual quality objectives which are being met through the implementation of an alternative.

(f) Historical and Cultural Resources - A large number of scientifically and historically valuable cultural resources are identified on the Forest. Over 50 new sites, mainly comprising prehistoric Indian campsites, are found each year as a result of the Forest's cultural resource inventory program. Cultural resources are an issue in the sense that many people are concerned about how many and how adequately these cultural sites are being preserved and protected in the face of ground disturbing projects and vandalism that occurs on the Forest. The more areas that are opened up to development for road construction, timber harvesting, and minerals and energy development, the more difficult it will be to protect these resources.

(g) Water Quality - The water quality and conditions along the shorelines of the lakes and streams on the Forest are good. As discussed above, water quality is one of the components which contribute to the outdoor lifestyles of Central Oregonians. In general, sedimentation of streams and lakes on the Forest is not a serious problem. However, to the extent that an emphasis on wood production forces harvesting on sensitive steep areas, and riparian zones, water quality may experience some degradation.

(h) Air Quality - Air quality is another important aspect of the Central Oregon area. For the most part, air quality conditions are good except during certain times during the winter when temperature inversions create woodstove polution problems, and certain times during the spring and summer when prescribed burning activities are going on.

Most of the firewood supply utilized in the area comes off of the Forest, and is directly related to the amount of accessable beetle-killed lodgepole pine. Different approaches for making firewood available to the public were explored in each of the alternatives. These involved different pricing and allocation strategies, and different rates of using the desireable dead lodgepole pine materials. In the short run (ie. 5 to 10 years), firewood burning and its related polution problems will continue to exist. After that, however, the supply situation changes from one alternative to another, and in some cases people may either be forced, or choose, to use some other energy source for heat. In which case, some benefits would be realized from improved air quality, even though the benefits of burning relatively inexpensive firewood as a way of life would be reduced.

Air quality degradation resulting from fuels treatment and prescribed burning activities is pretty much directly related to the amount of scheduled timber and vegetative management activities associated with an alternative. The more acres of these activities called for in an alternative, the lower the quality of the air during certain seasons of the year.

# V. SOCIAL AND ECONOMIC IMPACT ANALYSIS

Many communities, and the people who live within them, in the Central Oregon and nearby surrounding regions of the Pacific Northwest are dependent upon the Deschutes National Forest for their economic, recreational, and social way-of-life. Population levels, economic well-being, lifestyles, attitudes, beliefs, values, and social organization are all related to Forest Service activities to a certain extent. In fact, many of the issues, concerns, and opportunities which the planning process must address reflect the importance of the Forest to both local and regional publics. Therefore, it is essential that the economic and social consequences that could result from the implementation of land management planning decisions be considered during the evaluation of alternatives.

Economic impact analysis is a means by which ,relevant forest management decisions are evaluated with regards to their impacts on employment, personal income, and local government revenues within an area defined as the "forest influence zone". Social analysis, in turn, evaluates the polarization or cohesion effects that arise in different community types within the forest influence zone in response to land management planning decisions. This Chapter provides an overview and description of the economic and social impact analysis which was performed during the evaluation of alternatives for the Deschutes National Forest Draft Environmental Impact Statement and Forest Plan.

## A. Economic Overview

### 1. Forest Influence Zone As Established for Economic Analysis

To assess the current economic conditions and to estimate potential changes, a "Forest Influence Zone" was determined. The Forest Influence Zone is the geographic area where the majority of forest resources such as timber, recreation, range, water, and wildlife are first used and where public concern is concentrated. Traditionally, this area has been defined as Deschutes, southern Jefferson, and northern Klamath Counties. For purposes of economic impact analysis, Deschutes County was used as a surrogate for the full zone of influence.

However, the characteristics of this zone are currently undergoing some dramatic changes. Consequently, where to draw the lines to capture the more contemporary "Forest Influence Zone" is difficult to determine precisely. For example, prior to the 1980's, 85 percent or more of the timber sold by the Deschutes National Forest was purchased and processed by mills within Deschutes, southern Jefferson, and northern

Klamath Counties. Much of the remainder went to western Crook County. Since the early 1980's, the structure of the timber industry in Oregon has been experiencing many changes. The 1981-82 recession, a rash of speculative bidding and its associated buy-back legislation, increasing Canadian lumber imports, wilderness legislation, lawsuits and court injunctions on Forest Service timber sale activities, and uncertainty regarding the outcomes of Forest Planning have all played a role in reshaping the timber industry in the Region. One of the consequences has been a change in the market structure for timber sold off of the Deschutes National Forest. During 1983, only 47 percent of the stumpage sold on this Forest was purchased and processed by mills within the traditional zone of influence. However, the extent and duration of these types of changes is unknown at this time. Consequently, Deschutes County will continue to serve as a proxy for the Forest Influence Zone for purposes of economic impact analysis until a better understanding of the changing timber industry in the Northwest is obtained.

### 2. Population

In 1980 about 2.4 percent of Oregon's population lived in the Forest Influence Zone consisting of Deschutes County and adjacent portions of Klamath and Jefferson Counties. Ninety-five percent of these people lived in Deschutes County. A little over 13 percent of the State's people lived east of the Cascades. About 18 percent of the people residing in Oregon east of the Cascades live in the Forest Influence Zone.

The current estimated population for Deschutes County is 67,000. While so far during the 1980's, population increases in Deschutes County have been at an annual rate of 1.5 percent, the 1970's were a period of very rapid growth. From 1970 to 1980, the population in the area increased by 31,700, representing a doubling in size. Of this net change, the vast majority of the growth, 90 percent, was due to in-migration. The remainder was accounted for by natural increases.

As apparent from the statistics on in-migration, Deschutes County's growth depended on attracting people from outside the area. People cite recreation opportunities, climate, quality of life, and the aesthetics of living in a forested environment as reasons for moving to and living in Deschutes County.[1]

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[1] Obermiller, 1979.

## 3. Economy

Based on recent (May 1985) statistics from the State of Oregon Employment Division, about 28,000 people are employed in Deschutes County. Of course, this varies from season to season. Major industries in the Forest Influence Zone include agriculture, manufacturing, timber, recreation and tourism, government, and real estate and construction. The characteristics of these industries are briefly described below.

### a. Agriculture

About 6 percent of Deschutes County is considered to be farmland. Over half of this farmland is used for crops; the remainder is devoted to pasture.

Agriculture within the Forest Influence Zone has been diminishing in relative importance. In Deschutes County, gross cash farm income dropped from its 1973 high of $11.3 million to $8.6 million in 1977, then rose to $13.3 million in 1980. Using constant dollars, gross farm income actually declined from $10.7 million in 1973 to $7.5 million in 1980. In real terms County farm income fell by 30 percent between 1973 and 1980.

Based on estimates for 1984, livestock and poultry account for approximately 70 percent of the gross value of agricultural sales in Deschutes county. Of this, cattle and calves, horses and mules, and miscellaneous livestock are the major contributors. Of the horses and miscellaneous livestock, arabian horses and llama comprise a large share. Of the crops, alfalfa and potatoes are the primary contributors to the gross value of sales.

### b. Timber Harvesting

Mills in Deschutes County are heavily dependent on timber supplied by the Deschutes National Forest. However, this relationship has experienced some unprecedented changes over the last few years. Ten years ago, over 80 percent of the logs bought by Deschutes County mills came from the Deschutes National Forest. Likewise, nearly 90 percent of the timber cut on the Deschutes was purchased by firms within the local area. Since 1981 this relationship has changed to the point where in 1983 only 47 percent of the timber sold from the Deschutes was purchased within the traditional Forest Influence Zone. In the last two years, much of the volume has been going west over the Cascades. It is anticipated that for the next five to ten years local mills will continue to operate in this more competitive market for Deschutes timber.

Processing logs into lumber creates more jobs and personal income for Central Oregonians than does using trees for firewood or chips. However, while annual sale levels from the Deschutes National Forest have been relatively stable for the past 5 years (averaging 197 MMBF and ranging from 188 MMBF to 202 MMBF), the composition of this material is changing and could have some implications for the wood processing sectors of the economy. For the years 1980 through 1982, the sale volume did not include free personal use firewood which totals between 20 to 30 MMBF per year. In addition, about 20 MMBF of the volume for those years was utilized as chips or fiber and not processed in lumber mills. In other words, about 90 percent of the wood sold from the Deschutes during 1981 and 1982 was processed into lumber.

Beginning in 1983, the Forest began to charge for personal use firewood. Therefore, the volumes reported for those years include the 20 to 30 MMBF per year hauled out of the woods in pickup trucks as firewood. In addition, due to the accelerated harvesting of lodgepole, more and more trees are processed into chips instead of boards. This trend will probably continue for the next 5 to 15 years. Unless the total timber harvest levels on the Forest are increased in order to maintain the traditional sale volumes of ponderosa and mixed conifer species in addition to the accelerated volumes of lodgepole, there will continue to be a slight downward pressure on the amount of timber sold from the Forest which will be processed into boards in the local mills.

### c. Manufacturing

Of the approximately 28,000 people employed in Deschutes County, about 14 percent are involved in the manufacturing of both durable and nondurable goods. Most of these (about 13 percent of the total workforce) are employed in the lumber and wood products industry. While the role of this industry in the local economy is currently changinging, it is likely that the wood products industry will continue to be major component of the economy for the forseeable future.

### Primary Processing

Currently two major sawmills are operating in the Forest Influence Zone--one in Bend and one in Gilchrist. In addition, Prineville has one major sawmill and five smaller sawmills. The three major mills have large and small log handling facilities. Together these mills have an estimated installed capacity, on a two-shift level, of about 463 million board feet per year. Of this, 72 million board feet represent capacity for small logs. These mills processed an estimated 370 million board feet of timber in 1976. A veneer plant which has a capacity of 50 million board feet is located in Redmond.

Also, a particleboard plant is operating in Bend.

### Secondary Manufacturing

The dominant secondary wood processing activity in the Forest Impact Zone is millwork manufacturing. Ponderosa pine boards are the most common raw material for the industry. Furniture and cabinet making firms also exist in the area.

## d. Recreation and Tourism

Recreation and tourism, and the service industries which support it, are becoming an increasingly more important component of the economy. While it is difficult to say exactly how many jobs are generated by tourism and recreation related expenditures, opportunities for employment in the service sectors appear to be more stable than those in the more volatile timber industry. However, they also tend to be lower paying.

Most of the recreation activities are related to the lakes, mountains and forested environment of the Deschutes National Forest. In 1983, the Deschutes ranked fifth among the 19 Forests in the Pacific Northwest and 27th among the 125 Forests in the National System in recreation visitor day use. The Forest received an estimated 2.6 million visitor days of recreation use in 1982 and 2.5 million visitor days in 1983. Skiing and sightseeing on Mt. Bachelor attracted 549,692 people in the 1983 to 1984 season.

### e. Government

Currently, Federal, State, and local agencies employ about 14 percent of the total work force in Deschutes County. In light of the budget cuts projected for the forseeable future, it is unlikely that the government sectors will be able to contribute much to the economic growth of the region in the next 5 to 10 years.

### f. Real Estate and Construction

The development industry--real estate, construction, and finance--are the most volatile segments of the Deschutes County economy. During the 1970's they grew into a very important part of the economy as the City of Bend and surrounding Deschutes County experienced a doubling of the population. In 1970 the proportion of workers in the development industry was essentially the same for Deschutes County as for the United States as a whole. By 1978, construction accounted for over 8 percent of the Deschutes County work force while it accounted for less than 5 percent in Oregon, and about 5 percent in the Nation. Even more dramatically, in 1978, real estate employed 4.5 percent of the Deschutes County workers, while it accounted for only 1 percent of the total employment in the rest of the country. While these figures show that the development industry grew significantly during the last decade in Deschutes County, it has not been stable. Twice in the last 10 years, 1974 to 1975 and 1979 to 1981, major slumps in the development market hit Deschutes County hard.

## B. Social Overview

Social impact analysis is the process of assessing how Forest Service decisions and policies affect human social life. Human social life is influenced by surrounding physical and biological environments. This is most evident in rural areas where the variety and quality of available natural resources often determines the chief means of socio-economic livelihood and, therefore, influence local preferences for the use of public lands. Thus, proposed changes in the availability or permitted uses of National Forest resources are of importance to residents of affected communities, commercial users, and recreationists. Other people, including many who seldom visit the forest, also have a strong interest in how forest resources are managed.

For the DEIS, a team of people who had a feel for the pulse of the local communities developed the frame work of the social analysis under the guidance of the Regional Sociologist. Essentially, this consisted of delineating and categorizing different communities within the local area and surrounding regions in which the social environment could be affected by land management planning decisions, and then identifying those effects which might result from the implementation of each alternative.

## 1. Forest Influence Zone as Defined for Social Analysis

People and communities in the Zone of Influence have important, but different, ties to the Deschutes National Forest. The nature of these ties means that different aspects of the alternatives displayed in the Draft Environmental Impact Statement could affect each community or interest group somewhat differently. The Social Effects Work Group divided the area into four sub-areas for analyzing social effects. The four community types are described below. After the four types of communities were identified, two types of ties between Forest and community were established. One tie between Forest and community is its contribution of raw material for industry and the jobs it and Forest management provide. A second tie is the scenic and recreational environment the Forest offers to recreationists and residents. Two of the community types have very clear and nonoverlapping ties to the Forest while the other two communities are affected by both types of ties but in different ways.

### a. Rural Industrial Communities

Rural industrial communities are closely tied to the Forest in work, subsistence, and play, and are directly affected by what happens on the Forest. Obvious links between the Deschutes National Forest and these communities are logs for their harvesting, manufacturing, and transportation businesses. The wood products industry is the predominant industry in towns like Crescent, Gilchrist, Prineville, and Redmond. But timber is not the only tie. People in these communities use fuelwood, fish, and game for part of their subsistence. Recreation (often roaded and/or motorized) is also an important component of the life styles for these Central Oregonians and the provision of diverse recreation opportunities on the Forest provide is a major attraction to the area. While Prineville is considered as one of these community types, recreation and subsistence use by Prineville residents is more likely to occur on the Ochoco National Forest.

### b. Rural Recreation and Residential Communities

Rural recreation and residential communities near the Deschutes National Forest are based primarily upon recreation and recreation residences. Environmental and scenic amenities and nearby recreational opportunities are major reasons for their existence. Towns and settlements along the Metolius and upper Deschutes River, including both LaPine and Sisters are included in this community type. Local service-oriented businesses provide convenience items and cater to tourists, skiers, and sportsmen.

Air, water, and visual quality are issues of particular importance to these communities. Timber harvesting and prescribed or accidental burns on adjacent or visible Forest lands are typically community concerns. The provision of abundant fuelwood, fish and game are also important to these communities.

Changes in the appearance of the forest setting, amenities, and recreation opportunities provided by the Deschutes National Forest have direct impacts on these communities and any radical changes effecting these resources would probably result in the voicing of public concerns.

### c. Central Oregon Urban Center

This community type includes Bend which is the dominant community in the Forest Influence Zone. It has a large industrial sector based on wood products, and a large service sector keyed to recreation and tourism. It is the major shopping and service center for outlying communities. The socioeconomic health of the wood products industry and service sector and the quality of the environment are all central to Bend's residents.

As a larger and more diverse community, some conflicts over Forest management can be absorbed without much disruption. While more sensitive issues tend to pull people together within the smaller communities, they tend to polarize a community like Bend which has economic and emotional ties on all sides of the issues. The Deschutes National Forest, because of its amenities and economic contributions to Bend, renders it a Forest-dependent community.

### d. Westside Communities

While activities on the Deschutes National Forest do not directly impact the daily lives of people in the populous communities west of the Cascades, they are important to many of them for various reasons. In recent years, increasingly more Deschutes National Forest timber sales are being purchased by the westside wood products industry. In addition, the provision of a wide diversity of recreational opportunities is important to residents of the Willamette Valley and Portland metropolitan areas. These communities could represent the more diffuse Regional public which is affected by management decisions on the Deschutes National Forest.

Conflicts over resource management decisions on the Deschutes National Forest are more likely to be seen as symbolic of broader issues. Responses may reflect the position of specific interest groups rather than the sentiment of local residents who are directly affected by the issues.

## 2. Social Effects

The Forest Service plays an integral role in the socio-economic environment of Central Oregon. Accordingly, decisions which significantly change Forest Service land use policies and/or resource output levels can impact the socio-economic way of life. In order to evaluate the potential consequences associated with the implementation of land management planning decisions, three catagories of social effects were identified which would be directly linked to the alternatives. They are (1) Jobs and Lifestyles, (2) Community Cohesion, and (3) Expectations of Minimal Change.

### a. Jobs and Lifestyles

Management of the Deschutes National Forest has direct, indirect, and induced effects on many different aspects of the employment base in the Central Oregon economy. It also can have far reaching effects on many people's lifestyles. Negative effects on jobs and lifestyles occur when actions 1) reduce employment opportunities, 2) reduce the diversity of recreational opportunities, 3) reduce freedom to use the Forest for subsistance and recreation and, 4) lower the environmental qualities of the area.

### b. Community Stability and Cohesion

Social organization refers to the way society is structured. It includes the concepts of community stability and community cohesion. Both of these are related to the sense of belonging that is associated with mutual community interests and goals. In a community where different groups have a high degree of their own cohesion, a Forest Service action which is interpreted as being in favor of one group may become the focus of a problem for both the community and the Forest Service. Negative effects on community cohesion occur when issues divide a community and result in polarization. Forest Service decisions can either aggravate or help to alleviate existing conflicts.

### c. Expectations of Minimal Change

People in general prefer to have some certainty about what the future holds. Those who depend on the timber industry want assurance that an adequate supply of timber will be available to help maintain their jobs. Land designations to wilderness, unroaded recreation, and othe nontimber uses threaten that security. Conversely, resorts, outfitters, and others dependent upon recreation related businesses want to be assured that the Forest will be managed to enhance existing and future recreation opportunities. Regardless of whether the diverse needs of these different publics can be satisfied, the Deschutes National Forest policies can be designed to increase certainty about what will happen. With respect to expectations about minimal change, people in the area prefer slow to moderate growth compatible with concerns about the quality of life. Negative effects occur with sudden changes in (1) timber management practices, (2) the appearence of the Forest, (3) the public's freedom of use for recreation and firewood, (4) the supply of wood for industry, and (5) the development of energy sources.

## C. Analytical Tools and Sources of Data

Many tools are available for performing socio-economic impact analysis, each differing in their complexity, level of analytical detail, and data requirements. Input-output analysis was used to help evaluate the employment and income impacts associated with the proposed output and activity levels for each of the land management planning alternatives. These impacts were estimated for the first, second, and fifth decades based on the timber, recreation, range, and wildlife outputs for each alternative. The quantitative employment and income impacts were then qualitatively augmented with an assessment of the social consequences which could accompany the implementation of each alternative. This process comprised the soci-economic analysis performed during the development of the Deschutes National Forest DEIS and Forest Plan.

## 1. Economic Impact Analysis

The IMPLAN model was used to perform the economic impact analysis for the DEIS. IMPLAN is an input-output model software program which resides on the Univac[1] computer at Fort Collins Computer Center. It is not the purpose of this discussion to describe IMPLAN in detail. This can be ascertained in the User's Manual (August 1982) and several other papers which describe the IMPLAN system in detail.[2]

Economic input-output (I-O) analysis is a procedure for describing the structure of inter-industry dependencies in a regional economy. The region, in this case, is Deschutes County. I-O analysis is based upon the interdependence of the production and consumption sectors of the economy for the area being studied. Its foundation rests on the concept that industries must purchase inputs from other industries, as well as from primary sources (ie. natural resources), for use in the production of outputs which are then sold either to other industries or to final consumers. Thus, a set of I-O accounts can be thought of as a "picture" of an impact area's economic structure at one point in time. In this case, the one point in time is 1977. This structure is represented as a mathematical transactions matrix of buyers and sellers in the economy.

The proposed output levels associated with each alternative are repesented as changes in the current levels of final demand for these outputs in the IMPLAN model. The resulting production requirements needed to satisfy these changes in final demand and the flow of industrial inputs and outputs can then be traced via the I-O accounts to show the linkages between and the impacts on, the different industries composing the regional economy. Through mathematical matrix manipulations, the estimated direct, indirect, and induced impacts can be evaluated. The impacts concerning most people in the local economy are those dealing with the changes in employment and personal income.

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[1] Gregory S. Alward and Charles J. Palmer. IMPLAN: An Input-Output Analysis System for Forest Service Planning.

Also of interest are the changes in the amount of payments to counties in lieu of taxes that could result from implementing any of the alternatives. However, this analysis is separate from the input-output analysis, and will be discussed after the following brief review of the data and information that was used to construct and calibrate the Deschutes County I-O model.

### a. IMPLAN Data Base

The IMPLAN model has a database consisting of: (a) a national level technology matrix, and (b) a file of estimated activity levels for total gross output, six final demand components, three final payment indicators, and employment estimates for 466 industrial/business sectors.[3] The national level technology matrix is based on a 1972 Department of Commerce I-O model that was converted to an "industry by industry" basis and updated to 1977 using the RAS procedure.[4]

### b. National Data Base Reduction to Impact Area

The county level information is based on a 1977 data set constructed by Engineering Economics Associates of Berkeley, California. Utilizing the national technology matrix and the control totals for the Deschutes County, a data reduction method was employed to develop the input-output table for the economic impact area. The method used exploits the property of "openness" displayed by smaller regional economies when compared to the national economy.[5] Smaller regional economies exhibit much greater tendencies to import and export goods and services than does the national economy. Therefore, they are more "open" than the national economy. Based on the assumption that trade balances are the principal difference between national and regional purchase patterns (i.e., industry production functions are identical but regional imports and exports make local inter-industry transactions different), the supply-demand pool technique for data reduction was adopted.[6]

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[3] Gregory Alward, Charles Palmer, Evarard Lofting. IMPLAN: Forest Service Economic Impact Model.

[4] Clopper, Almon, et al. 1983: Interindustrial Forecasts of the American Economy, D.C. Heath and Company, Lexington, Mass. 1974.

[5] Richardson, H.W. 1972. Input-Output and Regional Economics. John Wiley and Sons, New York.

Once this step was done, the resulting Deschutes County 124 sector input-ouput model of the 1977 economy was compared against alternate sources of information regarding employment by sector in order to verify its reasonableness. These data sources included:

1) State of Oregon, Employment Division labor pool data.

2) County Business Patterns 1977.

3) Directory of Oregon Manufacturers 1978.

These comparisons indicated that the Deschutes I-O Model did a reasonably good job of reflecting the "picture" of the county economy as it was in 1977. However, the local economy has changed since that time. Some of the key changes are:

1) In 1977, Deschutes County was experiencing strong growth from which a large part of the economy revolved around development itself (i.e., real estate, new construction, banking and finance services, etc.). Deschutes County is no longer experiencing that kind of growth and the composition of the 1985 economy does not reflect such strength in these development related sectors.

2) Since 1977, at least three mills have constructed automated wood processing facilities for small diameter logs. These mills are much less labor intensive than the "average" mills reflected in the 1977 I-O model.

3) While the 1977 data reflects strong tourism and recreation related service sectors in the local economy, these sectors have continued to grow in importance since that time and actually reflect a more stable componenet of the economy than does the wood processing industry.

4) Since 1977, a computer and electronics industry has started to develop in the area.

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[6] Schaffer, W.A. and K. Chu. 1969. Nonsurvey techniques for constructing Regional interindustry models. Papers of the Regional Science Assoc. 23:83-101.

While these types of changes tend to make the employment and income predictions based on the 1977 I-O model of the County less reliable, they are not meaningless in the presence of some knowledge of how these recent changes would affect the predictions if they were made with a more current model of the economy.

### c. Final Demand Expenditures

For each alternative, the I-O model was used to translate proposed changes in resource output levels from their current levels of production into changes in employment and income for the County.

An intermediate step in this process was to equate the changes in the respective resource outputs into changes in final demand expenditures by sector. Final demand expenditures are different from the values used in the PNV efficiency analysis. The PNV efficiency analysis examines only the market value of the raw material that leaves the Forest. For the case of timber outputs, this would be the stumpage values. On the other hand, final demand expenditures represent the dollars spent by the ultimate consumer at the point of final consumption. The point of final consumption is the sector from which the ultimate consumer purchases a product or the sector beyond which the output is exported from the region. For example, the point of final consumption for an output of timber might be in the New Construction Sector because the timber is used in the construction of a house which a consumer may purchase. However, if the timber is exported following processing at the sawmill, the point of final consumption is the Sawmills and Planning mills sector. By identifying the final consumption point, the transactions of all industries involved in processing the output are considered. For more detail regarding how the final demand expenditures for Deschutes National Forest outputs were determined, refer to Sullivan's article[7] and the planning process records for IMPLAN.

For purposes of assessing the potential economic impacts which may result from the implementation of an alternative, output levels for 20 different resources were tracked. They are displayed in Table B-V-1.

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[7] Sullivan, Jay. Determining Changes in Final Demand for IMPLAN Economic Impact Analysis. IMPLAN Notebook

Table B-V-1 Outputs Considered for I-O Analysis

| Output | Unit of Measure |
|---|---|
| Ponderosa Pine-Bend RD | MMBF |
| Lodgepole Pine-Bend RD | MMBF |
| Mixed Conifer-Bend RD | MMBF |
| Mountain Hemlock-Bend RD | MMBF |
| Ponderosa Pine-Crescent RD | MMBF |
| Lodgepole Pine-Crescent RD | MMBF |
| Mixed Conifer-Crescent RD | MMBF |
| Mountain Hemlock-Crescent RD | MMBF |
| Ponderosa Pine-Fort Rock RD | MMBF |
| Lodgepole Pine-Fort Rock RD | MMBF |
| Mixed Conifer-Fort Rock RD | MMBF |
| Mountain Hemlock-Fort Rock RD | MMBF |
| Ponderosa Pine-Sisters RD | MMBF |
| Lodgepole Pine-Sisters RD | MMBF |
| Mixed Conifer-Sisters RD | MMBF |
| Mountain Hemlock-Sisters RD | MMBF |
| Livestock Range Forage | MAUM |
| Developed Recreation | MRVD |
| Dispersed Recreation | MRVD |
| Deer Hunting | MRVD |
| Personal Use Firewood Collection | MCORD |

These outputs were selected because they reflect the primary differences in the resource production levels between the alternatives, and they also have the most significance to the local economy. The timber outputs were subdivided into working groups and Ranger Districts because of their variations in final demand expenditures by sectors of the economy, and their different impacts on jobs and income. For example, milling ponderosa pine is more labor intensive than milling lodgepole pine which is processed primarily in computerized, small log mills. Also, the District from which the stumpage is sold is important because some Districts are greater exporters than others. For example, during the years 1979 through 1983, 96 percent of the stumpage sold from the Sisters RD was purchased and processed by mills within the local economic impact area. The comparable figure for the Fort Rock RD is 44 percent. Wood that is exported from the area before primary processing means fewer jobs and income in the local economy.

### d. Returns to the U.S. Treasury and Local Governments

Predicted returns to the U.S. Treasury and local Governments were calculated for each alternative. These returns illustrate the potential impacts of Forest management decisions on both the federal government receipts collected as a result of revenue producing programs on the Forest, and the resultant change in revenues passed on to the local governments.

Returns to the U.S. Treasury were calculated by deriving the revenue of income producing programs on the Forest which correspond to FSM 653112b "Annual Collections Statement", of the National Forest Fund. Cash returns to the Treasury from the Deschutes National Forest are generated by timber, recreation, range, and special use receipts. The 1982 base year (actually an average for the years 1980-1984) returns to the U.S. Treasury and local Governments generated by these programs are displayed in Table B-V-2 below.

Table B-V-2 Base Year Estimate of Returns to the U.S. Treasury and Local Governments ($000 1982)

| Revenue Source | U.S. Treas. Receipts | Local Gov. Receipts |
|---|---|---|
| Stumpage Sales | $27,063.0 | $6,765.8 |
| Rec. Fees & Special Uses | $ 622.3 | $ 155.6 |
| Range Allotments | $ 14.8 | $ 3.7 |
| Total | $27,700.1 | $6,925.1 |

Returns to local Governments are calulated as 25 percent of the returns to the U.S. Treasury funds. These are paid to the State of Oregon and eventually passed on to the local county Governments. These returns to the local counties are often referred to as payments in lieu of taxes.

The projections of these revenues for each alternative were based on their respective proposed output and activity levels for these programs. The stumpage receipts, which account for over 97 percent of the total returns to the government, are based on the FORPLAN harvest scheduling solutions for each alternative.

### 2. Social Impact Analysis

Once the economic impacts in terms of jobs, personal income, and the returns to government were completed, the anticipated social impacts that would result from implementation of each alternative were assessed. As described above under the Social Effects section, some of the social impacts could be tied to anticipated changes in the economic well-being of the Central Oregon Region as represented by the Deschutes County I-O model. However, not all of the social impacts are directly linked to concerns about jobs and income. Some of the social impacts revolve around the attitudes, beliefs, and values of different groups of citizens who are influenced either directly or indirectly by Forest management decisions. Sensitive issues regarding how the Forest should be managed tend to polarize some groups against others as they attempt to influence Forest Service decisions and policies.

To perform the necessary analysis, a Social Effects Team was assembled. The Team was composed of 5 to 6 people who represented different walks of life in the Central Oregon Area, and who had a good feel for the social structure of the Area of Influence (which as discussed above in the Social Overview, extended beyond the Economic Area of Influence to include the Willamette Valley and Portland Metropolitan Area as well).

The results of the social impact analysis were qualitative, rather than quantitative. For each alternative, statements were made regarding how some management decisions, policies, and output levels would affect community stability, cohesion, and polarization. This analysis, in conjunction with the quantitative economic impact analysis, provided a more complete socio-economic impact assessment with regard to the implementation of each alternative.

## D. Some General Information and Findings of the Socio-Economic Analysis

Chapters II and IV of the DEIS present the details of the anticipated soio-economic impacts associated with the implementation of each alternative. In particular, Table II-3a displays the estimated impacts associated with each alternative for the first, second, and fifth decades (as represented by the individual years 1986, 2000, and 2030) with regards to jobs, personal income, total returns to the U.S. Treasury, and the payments to counties in lieu of taxes. In this final section of Appendix B-Chapter V, a generalized brief narrative of the findings is presented.

The modeling of economic impacts was based on the proposed changes in resource output levels between the respective alternatives and the output levels upon which the current economy is based (represented by the outputs of the Current Direction Alternative). These changes were used as input to the I-O model and it, in turn, would provide the estimated direct, indirect, and induced impacts on jobs and income among other things. Table B-V-3 presents the current output levels for each resource, and the total jobs and income response coefficients that would result from an output change of one unit for each resource. For example, under the current forest plan, the Bend Ranger District has been selling approximately 33 MMBF of ponderosa pine annually. If an alternative proposed increasing this by 1 MMBF, a potential increase of 8.933 jobs and .226 $MM could be realized in the local economy after all direct, indirect, and induced effects were accounted for.

Table B-V-3 Employment and Income Response Coefficients by Resource

| Output Name | Units | Current Output Levels | Employment Response (# OF JOBS) | Income Response ($MM) |
|---|---|---|---|---|
| PPN-BEND RD | MMBF | 33.0 | 8.933 | .226 |
| LPP-BEND RD | MMBF | 13.2 | 5.721 | .146 |
| MC-BEND RD | MMBF | 2.7 | 8.943 | .225 |
| MH-BEND RD | MMBF | 0.0 | 5.871 | .148 |
| PPN-CRESCENT RD | MMBF | 10.4 | 9.589 | .241 |
| LPP-CRESCENT RD | MMBF | 12.5 | 6.276 | .159 |
| MC-CRESCENT RD | MMBF | 21.1 | 9.359 | .235 |
| MH-CRESCENT RD | MMBF | 0.0 | 6.180 | .155 |
| PPN-FORT ROCK RD | MMBF | 25.5 | 6.529 | .168 |
| LPP-FORT ROCK RD | MMBF | 12.5 | 5.087 | .130 |
| MC-FORT ROCK RD | MMBF | 0.9 | 6.591 | .168 |
| MH-FORT ROCK RD | MMBF | 0.0 | 4.147 | .106 |
| PPN-SISTERS RD | MMBF | 17.9 | 9.881 | .248 |
| LPP-SISTERS RD | MMBF | 0.0 | 7.798 | .196 |
| MC-SISTERS RD | MMBF | 41.2 | 9.303 | .233 |
| MH-SISTERS RD | MMBF | 0.0 | 6.138 | .154 |
| LIVESTOCK RANGE | MAUM | 29.0 | 0.398 | .010 |
| DEVELOPED REC | MRVD | 1287.0 | 2.150 | .027 |
| DISPERSED REC | MRVD | 1403.0 | 1.555 | .024 |
| DEER HUNTING | MRVD | 222.0 | 1.079 | .019 |

In general, alternatives which emphasize commodity outputs tend to have more positive impacts on the local economy in terms of jobs, personal income, and payments to counties. For the most part, the economic impact differences between the alternatives in the first two decades are primarily a function of the differences in their timber programs. While total volume proposed for sale is a key factor, species composition is also an important consideration since the sale of ponderosa pine and douglas fir has greater positive economic consequences to the local economy than do lodgepole pine or mountain hemlock.

Land management decisions concerning the recreation resources on the Forest are also important to the local economy in terms of jobs and income (percentwise, recreation does not contribute much to the federal or local government treasuries). However, the effects of the alternatives with respect to recreation land allocations and investments do not often become evident to the local economy until the later decades. This is due to the fact that recreation use on the Forest is assumed to grow commensurately with the population projections for the State of Oregon (about 2 percent per year, which results in a doubling of use in 35 years). It is assumed that in the early decades, recreation decisions in the alternatives may affect the quality of recreation experiences, and possibly where on the Forest they would happen. However, it is assumed that people would continue to use the Forest and spend money in the local economy at near current levels, which is really what creates and maintains the recreation related economic base. However, in the later decades as potential use levels begin to significantly increase, the service sector jobs which facilate the recreation and tourism industries show increasing growth and continue to play a more important role in the Central Oregon economy. It is at this stage that the differences between the alternatives with regard to recreation related economic impacts become more apparent.

With regards to social impacts, different groups will be affected differently depending on the nature of the alternative being considered. Commodity oriented alternatives tend to do well in maintaining the economic aspects of the social structure in the area. Increased supplies of timber in particular provide the where-with-all for the local wood processing industry to respond to regional and national markets , which in turn means more, relatively higher paying jobs for Central Oregonians. To the extent that some communities are more dependent upon the wood products industry than others, they will benefit. In addition, more timber means more revenues to the counties. This is also an asset when it comes to implementing and maintaining public projects in the local communities, whether they be timber dependent or not.

Finances aside, other types of Forest Service decisions can influence the social well-being of Forest dependent communities. Generally, those groups or communities which view or use the Forest from an amenity standpoint are positively impacted by amenity-oriented alternatives and negatively affected by those alternatives with a commodity emphasis. Decisions regarding whether or not to develop roadless areas for timber harvesting, where and to what extent the potential geothermal resources on the Forest should be permitted to be developed, and how much timber should be harvested at the expense of scenic quality, wildlife, and other noncommodity types of resources will tend to polarize groups with different values and pull together groups with common values. Different issues may change the composition of the groups.

These implications apply to communities as well as to groups within the communities. While most social groups can be found to some extent in each community, different groups may dominate in certain communities (discussed in the Social Overview above). Towns like Crescent and Gilchrist tend to be oriented around commodity uses of the Forest, whereas communities like Sisters and Camp Sherman are more amenity oriented. Bend, on the other hand, is large enough and diverse enough to experience some internal polarization over sensitive forest resource management issues.

Finally, almost all groups and communities can adapt to slow changes in their environment. However, rapid and dramatic changes in the way the Forest is managed are likely to bring about broad levels of social disruption.

# VI. ANALYSIS PRIOR TO DEVELOPMENT OF ALTERNATIVES

## A. Introduction

The primary analysis performed prior to the development of alternatives was the "Analysis of the Management Situation" (AMS). During this step, the conditions of the Forest, its ability to produce outputs, and society's demands for its resources are assessed. The analysis performed during this step helps to define the "decision space" within which the Forest can operate to address the planning issues, concerns, and opportunities. The detailed results of this analysis step can be found in the planning documents titled "Analysis of the Management Situation", and "A summary of the Analysis of the Management Situation".

An important step in the Analysis of the Management Situation is the "Benchmark Analysis". The benchmark analysis was performed in compliance with the national planning direction requirements for establishing benchmark levels. The resulting benchmarks served as reference points from which the costs and effects of various objectives and constraints used in the subsequent development of alternatives were evaluated. More specifically, the purposes of the Benchmarks were to:

1. Define the maximum potentials of the Forest to produce both economic benefits and resource output levels for market and non-market goods.

2. Evaluate the complementary and conflicting production relationships (tradeoffs) between pertinent market and non-market goods which the Forest can provide to the public.

3. Analyze the relative efficiencies and implications of constraints used to satisfy legal, policy, and discretionary resource management requirements.

4. Identify the range within which alternatives can be developed.

5. Help analyze the implications of continuing on with Current Management Direction and, if necessary, to identify a need for change.

To accomplish these five objectives, a series of required and optional benchmarks were developed and analyzed in accordance with Regional Planning Direction (November 10, 1983). For this purpose, several analytical tools were employed. The FORPLAN model was used to analyze the timber harvest schedules associated with the various benchmarks. The R2MAP grid mapping system was instrumental in providing FORPLAN with spatial information regarding resource inventories and land allocations. Electronic spreadsheets were used to help calculate the projected recreation and range outputs and effects associated with the benchmarks. Spreadsheets were also constructed to assist with the present net value calculations and estimated budgetary requirements for certain pertinent benchmarks. Utility software programs were developed to help in the analysis of vegetative diversity and to convert the cubic feet of wood outputs to boardfeet. The Tranship Model was used to help analyze the transportation network requirements. And finally, professional judgment and conjecture was involved in all aspects of the analysis.

## B. Development of the Minimum Management Requirements (MMR's)

As the process of developing Benchmarks and Alternatives was under way, National direction was developed to ensure that they complied with the minimum requirements of applicable laws and regulations. Subsequently, the Pacific Northwest Region developed direction to ensure that the minimum requirements were applied consistently accross all Forests within the Region. This direction was incorporated into a matrix and distributed under a letter dated February 9, 1983, Land and Resource Management Planning (1920). The subject of the letter was "Regional Guidelines for Incorporating Minimum Management Requirements in Forest Planning". The letter and matrix are on file at the Regional Office, Pacific Northwest Region, Portland, Oregon, and the Supervisor's Office, Deschutes National Forest, Bend, Oregon. Since the document is lengthy and not totally pertinent to the resource management situation on the Deschutes National Forest, only its more significant points are summarized in the following section.

Regional direction provided guidelines for MMR's pertaining to the management of the following resources:

1. Timber
2. Fish and Wildlife
3. Soil and Water Resources and Land Productivity
4. Water Quality
5. Riparian Areas
6. Range
7. Miscellaneous

The Deschutes Interdisciplinary Team, in assessing the relevant resource management situations and planning issues, determined that for many of the resources addressed in the Regional MMR Direction, the application of standards and guidelines combined with coordination could protect most of the resources without impacting outputs or the production of goods and services on the

Forest. Specifically, the MMR's for soil and land productivity, water quality, riparian areas, and range could be met without developing special requirements or restrictions. While these are important resources on the Forest, no serious or significant problems are associated with them. Nor are there significant issues pertaining to the management of these resources which need to be addressed. Refer to Chapter III of the DEIS for more detailed discussions of individual resources.

On the other hand, it was necessary to apply the Regional guidelines in order to provide for the MMR's related to the timber and wildlife resources. With regard to timber harvesting, the regulations require that harvest units do not exceed 40 acres in size and that a logical harvest unit is left between them. The nebulous term involved here is "logical harvest unit". On the Deschutes, better than 90 percent of the tentatively suitable and available commercial forest land can be tractor logged. This gives the Forest quite a bit of flexibility in designing leave strips which at some time in the future will be logical harvest units.

The Regulations also require that the leave units can not be harvested until the adjacent previous harvest units are no longer considered an opening. An area is no longer considered an opening once it is adequately stocked with trees 4.5 feet tall. On the Deschutes, this condition is assumed to be achieved in 10 years after final harvest.

In order to ensure that these conditions were achieved in the benchmarks and alternatives, constraints were used in FORPLAN which put an upper limit on the proportion of an area (almost at the analysis area level) which could be in harvest created openings at one time. The proportions used were based on the following analytical steps:

1) The first step was the development of a grid on which various sizes of cutting units ranging from 10 to 40 acres were placed. The logical harvest units left between them varied in size from 20 to 40 acres. An additional consideration in the size and shape of the logical harvest units was the width of the strips left between the existing cutting units. The analysis was repeated using 210, 420, and 640 foot wide leave strips between the harvest units. What this displayed was a range in the percent of an area that could be cut in any one decade given different size cut and leave units, and various distances between units. This showed, for example, that if 40 acre size areas were harvested with leave strips between units of approximately 200 feet in width, up to 74 percent of an area could be harvested in any one decade. If leave strips are expanded to approximately 600 feet, then 46

percent of an area could be harvested. This showed what the possibilities were but did not define the minimum requirement. For more details regarding this analysis, refer to the unpublished paper titled "The Appropriate Size of Logical Harvest Units" written by Tony Smith (Sept 1982). This can be obtained from the process records in the Supervisor's Office, Deschutes National Forest, Bend, Oregon.

2. The second step in determining the minimun requirements concerning how much of an area could be harvested in any decade (harvest dispersion constraint) was to apply somewhat of the same procedure to actual mapped analysis areas. Cutting unit sizes of mostly 40 acres, but of varying shapes, were mapped onto mature and immature sawtimber analysis areas with 20 to 40 acre logical harvest units left between them. From this analysis, it was determined that approximately 50 percent of an area could be harvested in any decade and not violate the minimum management requirements for harvest unit sizes and dispersion. This 50 percent upper limit proportion constraint was applied in FORPLAN by Ranger District (Level One), working group (Level Four), and maturity class (Level Six). However, it was not applied to the mature lodgepole pine analysis areas because of the mountain pine beetle epidemic. Cutting unit sizes larger than 40 acres are permitted in mature lodgepole due to the catastrophic insect damage in this working group. This is provided for in Section 219.27(d)(2)(iii). Wildlife habitat, water, soil or other resources were not considered in development of the harvest dispersion constraint. Only the cutting unit size and the leave areas were considered.

To meet the MMR's for wildlife habitat, the Regional Direction was followed very closely. Species on the Deschutes for which minimum requirements were developed are the northern spotted owl, bald eagle, goshawk, northern three-toed woodpecker, pine marten, and primary cavity nesting species. Following are the steps that were followed in developing the amount and distribution of habitats needed to meet the minimum requirements.

1. Capable habitat for all of the above mentioned species in Wilderness, Research Natural Areas and the Bend Municipal Watershed was mapped.

2. All capable habitat on lands that were determined to be not suited for timber production were mapped.

3. Then, the remaining needs for bald eagle habitat were mapped in the tentatively suitable and available commercial forest land. The amount and distribution of habitat was in compliance with the Interim Recovery Plan for the bald

eagle. A formal consultation was requested and a conservation opinion was received concerning the proposed approach for managing bald eagle habitat.

4. Habitat for spotted owls was then mapped. Capable habitat for spotted owls on the Deschutes is limited and somewhat isolated. The distribution requirements in the Regional Direction could not be applied on the Forest because of the limited habitat available. Considering this, all occupied habitats were used to meet the minimum requirements. This included seven areas outside of Wilderness.

5. Habitat for the pine marten, goshawk, and northern three-toed woodpecker were then mapped by "filling in" where habitat was not provided by steps 1-4 above. In this process, habitat was selected based on the minimum acres for each species as defined in the Regional Direction. The maximum distance between habitats was used.

6. While selecting habitats, full advantage was taken of overlap. For example, if a spotted owl area was located where it also satisfied the distribution requirements for pine marten, then it served for both the spotted owl and the pine marten in that particular area. The same was true for overlapping habitat for northern three-toed woodpeckers and goshawks. Often times, the same lodgepole pine area could provide the habitat needs for both species.

7. The selection and distribution of habitats was coordinated with the Fremont, Winema, and Willamette National Forests as well as the Oregon Department of Fish and Wildlife.

8. Minimum habitat needs for the primary cavity nesters were established at 20 percent of the maximum biological potential. The number and size of trees to provide this habitat was determined and the timber yield tables were reduced accordingly.

The Interdisciplinary Team determined that the habitat needs for most of these species could be achieved either through a "dedicated" (no programmed harvesting) or "managed" (stands are scheduled for harvest in FORPLAN) approach. In the managed approach for bald eagles and spotted owls, prescriptions and constraints were combined and applied to the designated habitat area. The prescriptions provided for old growth characteristics via extended rotation lengths (i.e., 300+ years). The constraints put an upper limit on the proportion of the area which could be harvested in each decade with the overall intent being to perpetuate an uneven aged, multi-storied area with some old growth nesting trees.

The habitat needs for the three-toed-woodpeckers, goshawks, and pine martens were achieved via the application of lower bound inventory constraints for mature sawtimber stands by working group and by Ranger District. Habitat was provided for the cavity nesters by reducing the volume in the FORPLAN yield tables to leave enough trees after final harvest to eventually become snags.

After MMR habitats were selected and distributed, the effects of using "managed" versus "dedicated" prescriptions to fulfill the requirements were evaluated. Results of that analysis are found in Section D of this Chapter.

## C. The Formulation of Benchmarks and Their Results

Approximately 30 benchmarks were formulated and analyzed in order to help define the production potentials and economic relationships of the market and non-market resources on the Forest. As mentioned above, many of benchmarks were developed and analyzed in accordance with the Regional Planning Direction (November 10, 1983). Those benchmark runs which were specifically described in the Regional Direction package will be referred to by their run numbers in that package. This should facilitate ease of discussion and comparison between Forests in the Region. This section describes the purpose of each benchmark, and the way it was formulated in terms of objectives, constraints, and assumptions.

### 1. Run-1

#### a. Purpose and Background

1) Since its formulation is relatively simple, it provides a good opportunity for checking and calibrating the FORPLAN model under a volume maximization objective function prior to proceeding on with the other benchmark analyses. The absence of economic influences on the outcomes provides a basis for verifying that the model is reasonable in terms of its timber yield and growth functions.

2) Since this run is similar to runs that were performed in previous land management/timber management planning efforts, it offers a point of comparison between past and present estimates of biological potential. Therefore, it provides a basis for all concerned parties to reach an agreement on the validity of the yield tables and acreage base before additional runs are done.

3) Provides a basis for understanding the relationship between nondeclining flow and the selection of timber management intensities and timing options.

b. Formulation

1) Objective Function- Maximize timber for first decade

2) Land Base- All tentatively suitable and available CFL's are available for programmed timber harvesting

3) Constraints-

a) Nondeclining flow (NDF) at or below the long run sustained yield (LRSY)

b) Rotations based on 95 percent of culmination of mean annual increment (CMAI)

c) Ending Inventory Constraint

4) Yield Tables- No reductions for wildlife snag trees

2. Run-2

a. Purpose and Background

In the benchmark analysis when nondeclining flow is not imposed, a 25 percent sequential upper and lower bounds constraint is to be used in conjunction with a floor of 80 percent of the current harvest level. This will help to mitigate against unacceptable fluctuations in employment levels and reduce the chances of unacceptable management situations in the future decades. The sequential upper and lower bounds are largely surrogates for downward sloping demand curves which are not included in the FORPLAN formulations.

The following information is provided:

1) Forms a base run for evaluating the opportunity costs of harvest floors

2) Forms a base run to use in formulating and evaluating minimum management requirements (36 CFR 219.27)

b. Formulation

1) Objective Function- Maximize PNV for 15 decades

2) Land Base- All tentatively suitable and available CFL's are available for programmed timber harvesting

3) Constraints-

a) Sequential upper and lower bounds of 25 percent for 15 decades

b) A 15 decade harvest floor equal to 80 percent of the current harvest levels on the Forest. The floor is equal to 316 MMCF per decade.

c) Harvest rotations are based on economic criteria rather than 95 percent of CMAI.

d) Ending inventory constraint

4) Yield Tables- No reductions for wildlife snag trees

3. Run-3

a. Purpose and Background

1) This run and Run-2 are suggested as the base runs to employ for analyzing the MMR's

2) When this run is compared to Run-2, the opportunity costs of nondeclining flow in combination with rotations restricted to 95 percent of CMAI can be shown given the absence of MMR's

3) When this run is compared to Run-1, we can show differences that result when a maximum PNV objective function is used in place of a maximum timber objective function

b. Formulation

1) Objective Function- Maximize PNV for 15 decades

2) Land Base- All tentatively suitable and available CFL's are available for programmed timber harvesting

3) Constraints-

a) Nondeclining flow at or below LRSY

b) Rotations based on 95 percent of CMAI

c) Ending inventory constraint

4) Yield Tables- No reductions for wildlife snag trees

4. Run-3a

a. Purpose and Background

Both dedicated and managed approaches for satisfying the wildlife MMR's on the Forest were evaluated for their impacts on timber-related economics and outputs. This run was used to assess the dedicated approach for meeting the wildlife MMR's with regard to bald eagles, northern spotted owls, goshawks, pine martens, three-toed-woodpeckers, and the cavity nesting species.

b. Formulation

1) Objective Function - Maximize PNV for 15 decades

2) Land Base- All tentatively suitable and available CFL's are available for programmed timber harvesting except those needed to meet the wildlife MMR's. MMR acres are assigned to minimum level management prescriptions (i.e., no programmed harvesting)

3) Constraints-

a) NDF at or below the LRSY

b) Rotations based upon 95 percent of CMAI

c) Ending inventory constraint

4) Yield Tables- Yield tables reflect volume reductions to account for enough snag replacement trees to maintain the habitat for 20 percent of the cavity nester population potential.

5. Run-3b

a. Purpose and Background

This benchmark is used to evaluate the impacts on timber related PNV and outputs when the managed approach to meeting the wildlife MMR's for bald eagles, northern spotted owls, goshawks, pine martens, three-toed-woodpeckers, and cavity nesters is utilized.

b. Formulation

1) Objective Function- Maximize PNV for 15 decades

2) Land Base- All tentatively suitable and available CFL's are available for programmed timber harvesting. However, special prescriptions are applied to the bald eagle and spotted owl MMR acres

3) Constraints-

a) NDF at or below LRSY

b) General Forest rotations based on 95 percent CMAI

c) Ending inventory constraints

d) Upper limit rate of harvesting constraints in bald eagle and spotted owl MMR areas

e) Lower bound constraints on mature and over mature timber to help meet the habitat needs for goshawks, pine martens, and three-toed-woodpeckers

4) Yield Tables- Yield tables reflect volume reductions to account for enough snag replacement trees to maintain the habitat for 20 percent of the cavity nester population potential

6. Run-3c

a. Purpose and Background

This benchmark is used to evaluate the tradeoffs between the timber related economics and outputs when the managed approach to achieving bald eagle MMR's is used.

b. Formulation

1) Objective Function- Maximize PNV for 15 decades

2) Land Base- All tentatively suitable and available CFL lands are available for programmed timber harvesting. However, special Threatened and Endangered (T&E) prescriptions are applied to bald eagle MMR areas

3) Constraints-

a) NDF at or below LRSY

b) General Forest rotations based on 95 percent CMAI

c) Ending inventory constraints

d) Upper limit rate of harvesting constraints in bald eagle MMR areas

4) Yield Tables- No reductions for wildlife snag trees

7. Run-3d

a. Purpose and Background

This benchmark is used to evaluate the tradeoffs between the timber related economics and outputs when the managed approach to achieving spotted owl MMRs is used.

b. Formulation

1) Objective Function- Maximize PNV for 15 decades

2) Land Base- All tentatively suitable and available CFL's are available for programmed timber harvesting. However, special Threatened and Endangered (T&E) prescriptions are applied to spotted owl MMR areas

3) Constraints-

a) NDF at or below LRSY

b) General Forest rotations based on 95 percent CMAI

c) Ending inventory constraints

d) Upper limit rate of harvesting constraints in spotted owl MMR areas

4) Yield Tables- No reductions for wildlife snag trees

8. Run-3e

a. Purpose and Background

This benchmark is used to evaluate the tradeoffs between the timber related economics and outputs when the managed approach to achieving goshawk, pine marten, and three-toed-woodpecker MMR's is used.

b. Formulation

1) Objective Function- Maximize PNV for 15 decades

2) Land Base- All tentatively suitable and available CFL are available for programmed timber harvesting

3) Constraints-

a) NDF at or below LRSY

b) General Forest rotations based on 95 percent CMAI

c) Ending inventory constraints

d) Lower bound inventory acreage constraints for mature and overmature sawtimber by working group and Ranger District in order to achieve the MMRs for goshawks, pine martens, and three-toed-woodpeckers

4) Yield Tables- No reductions for wildlife snag trees

9. Run-3f

a. Purpose and Background

This benchmark is used to evaluate the tradeoffs between the timber related economics and outputs associated with meeting the cavity nester MMR's.

b. Formulation

1) Objective Function- Maximize PNV for 15 decades

2) Land Base- All tentatively suitable and available CFL's are available for programmed timber harvesting.

3) Constraints-

   a) NDF at or below LRSY

   b) General Forest rotations based on 95 percent CMAI

   c) Ending inventory constraints

4) Yield Tables- Yield table reflect volume reductions to account for enough snag replacement trees to maintain the habitat for 20 percent of the cavity nester population potential.

10. Run-3g

a. Purpose and Background

The regulations state that "cut blocks, patches, or strips shall not exceed 40 acres in size and they should have one logical harvest unit between them (36 CFR 219.27 (d)(2)). Many acres were mapped to analyze what this meant in terms of percent of an area that could be harvested in one decade and still comply with these requirements. Three benchmarks were examined. Each with different percents representing different distances between the units. This run analyzes the implications to timber related economics and outputs of using a 30 percent dispersion constraint (the same percent used in the 1982 DEIS). For more information, refer to a document in process records entitled "The Appropriate size of Logical Harvest Units", Tony Smith, September 1982.

b. Formulation

1) Objective Function- Maximize PNV for 15 decades

2) Land Base- All tentatively suitable and available CFL's are available for programmed timber harvesting

3) Constraints-

   a) NDF at or below the LRSY

   b) General Forest rotations based on 95 percent CMAI

   c) Ending inventory constraints

   d) Upper limit dispersion constraints of 30 percent in General Forest areas

4) Yield Tables- No reductions for wildlife snag trees.

11. Run-3h

a. Purpose and Background

The regulations state that "cut blocks, patches, or strips shall not exceed 40 acres in size and they should have one logical harvest unit between them" (36 CFR 219.27 (d)(2)). Many acres were mapped to analyze what this meant in terms of percent of an area that could be harvested in one decade and still comply with these requirements. Three benchmarks were examined. Each with different percents representing different distances between the units. This run analyzes the implications to timber related economics and outputs of using a 46 percent dispersion constraint (this represents 630 feet between units). For more information, refer to a document in process records entitled "The Appropriate size of Logical Harvest Units", Tony Smith, September 1982.

b. Formulation

1) Objective Function- Maximize PNV for 15 decades

2) Land Base- All tentatively suitable and available CFL's are available for programmed timber harvesting

3) Constraints-

a) NDF at or below the LRSY

b) General Forest rotations based on 95 percent CMAI

c) Ending inventory constraints

d) Upper limit dispersion constraints of 46 percent in General Forest areas

4) Yield Tables- No reductions for wildlife snag trees

12. Run-3i

a. Purpose and Background

The regulations state that "cut blocks, patches, or strips shall not exceed 40 acres in size and they should have one logical harvest unit between them" (36 CFR

219.27 (d)(2)). Much mapping work was done to analyze what this meant in terms of percent of an area that could be harvested in one decade and still comply with these requirements. Three benchmarks were examined. Each with different percents representing different distances between the units. This run analyzes the implications to timber related economics and outputs of using a 58 percent dispersion constraint (this represents 420 feet between units). For more information, refer to a document in process records titled "The Appropriate size of Logical Harvest Units", Tony Smith, September 1982.

b. Formulation

1) Objective Function- Maximize PNV for 15 decades

2) Land Base- All tentatively suitable and available CFL's are available for programed timber harvesting

3) Constraints-

a) NDF at or below the LRSY

b) General Forest rotations based on 95 percent CMAI

c) Ending inventory constraints

d) Upper limit dispersion constraints of 58 percent in General Forest areas

4) Yield Tables- No reductions for wildlife snag trees

13. Run-3i

a. Purpose and Background

This benchmark is used to evaluate the sensitivity of the timber related economics and outputs of an across the board 20 percent increase in timber management costs

b. Formulation

1) Objective Function- Maximize PNV for 15 decades

2) Land Base- All suitable and available CFL's are available for programmed timber harvesting

3) Constraints-

a) NDF at or below LRSY

        b) General Forest rotations based on 95 percent CMAI

        c) Ending inventory constraint

    4) Yield Tables- No reductions for wildlife snag trees

14. Run-3k

  a. Purpose and Background

  This benchmark is used to evaluate the sensitivity of the timber related economics and outputs of an across the board 20 percent decrease in timber management costs.

  b. Formulation

    1) Objective Function- Maximize PNV for 15 decades

    2) Land Base- All suitable and available CFL's are available for programmed timber harvesting

    3) Constraints-

        a) NDF at or below LRSY

        b) General Forest rotations based on 95 percent CMAI

        c) Ending inventory constraint

    4) Yield Tables- No reductions for wildlife snag trees

15. Run-3l

  a. Purpose and Background

  This benchmark is used to evaluate the sensitivity of the timber related economics and outputs of using a 0 percent real price trend for stumpage as opposed to the Regionally directed 1 percent

  b. Formulation

    1) Objective Function- Maximize PNV for 15 decades

    2) Land Base- All suitable and available CFL's are available for programmed timber harvesting

3) Constraints-

a) NDF at or below LRSY

b) General Forest rotations based on 95 percent CMAI

c) Ending inventory constraint

4) Yield Tables- No reductions for wildlife snag trees

16. Run-3m

a. Purpose and Background

This benchmark is used to evaluate the sensitivity of the timber related economics and outputs of using a 2 percent real price trend for stumpage as opposed to the Regionally directed 1 percent.

b. Formulation

1) Objective Function- Maximize PNV for 15 decades

2) Land Base- All suitable and available CFL's are available for programmed timber harvesting

3) Constraints-

a) NDF at or below LRSY

b) General Forest rotations based on 95 percent CMAI

c) Ending inventory constraint

4) Yield Tables- No reductions for wildlife snag trees

17. Run-3n

a. Purpose and Background

This benchmark is used to evaluate the sensitivity of the timber related economics and outputs of using a 3 percent real price trend for stumpage as opposed to the Regionally directed 1 percent

b. Formulation

1) Objective Function- Maximize PNV for 15 decades

2) Land Base- All suitable and available CFL's are available for programmed timber harvesting

3) Constraints-

a) NDF at or below LRSY

b) General Forest rotations based on 95 percent CMAI

c) Ending inventory constraint

4) Yield Tables- No reductions for wildlife snag trees

18. Run-4

a. Purpose and Background

1) This is one of the economic benchmarks required by the Regulations (36 CFR 219.12(E)(1)(iii)(b)).

2) When this run is compared to Run-2, the Forest can show the opportunity costs of the combination of MMR's given an objective function of maximum PNV (assigned values) subject to sequential upper and lower bounds, floors, ceilings, MMR's, and ending inventory constraints.

b. Formulation

1) Objective Function- Maximize PNV for 15 decades (assigned values)

2) Land Base- All suitable and available CFL's are available for programmed timber harvesting. Special prescriptions are assigned to intensive recreation, and the MMR bald eagle and spotted owl areas

3) Constraints-

a) Departure from NDF based on 25 percent sequential upper and lower bounds and a 15 decade 316 MMCF floor (80 percent of current harvest levels)

b) General Forest rotations based on economic criteria (i.e., short of 95 percent CMAI)

c) Ending inventory constraint

d) Upper limit rate of harvesting constraints in bald eagle and spotted owl MMR areas

e) Upper limit rate of harvesting constraints in intensive recreation areas to achieve visual objectives

f) Upper limit dispersion constraints of 58 percent in General Forest

g) Lower limit inventory constraints for mature and overmature sawtimber to meet the MMR requirements for goshawks, pine martens, and three-toed-woodpeckers

4) Yield Tables- Yield tables reflect volume reductions to account for enough snag replacement trees to maintain the habitat for 20 percent of the cavity nester population potential.

19. Run-5

a. Purpose and Background

1) This is one of the economic benchmarks required by the Regulations (36 CFR 219.12(E)(1)(iii)(c)).

2) When this run is compared to Run-4, the Forest can show the opportunity costs of restricting rotations to 95 percent of CMAI given an objective function of maximum PNV (assigned values) subject to sequential upper and lower bounds, floors, ceilings, MMR's, and ending inventory constraints.

b. Formulation

1) Objective Function- Maximize PNV for 15 decades (assigned values)

2) Land Base- All suitable and available CFL's are available for programmed timber harvesting. Special prescriptions are assigned to intensive recreation, and the MMR bald eagle and spotted owl areas

3) Constraints-

a) Departure from nondeclining flow based on 25 percent sequential upper and lower bounds and a 15 decade 316 MMCF floor (80 percent of current harvest levels)

b) General Forest rotations based on 95 percent CMAI

c) Ending inventory constraint

d) Upper limit rate of harvesting constraints in bald eagle and spotted owl MMR areas

e) Upper limit rate of harvesting constraints in intensive recreation areas to achieve visual objectives

f) Upper limit dispersion constraints of 58 percent in General Forest

g) Lower limit inventory constraints for mature and overmature sawtimber to meet the MMR requirements for goshawks, pine martens, and three-toed-woodpeckers.

4) Yield Tables- Yield tables reflect volume reductions to account for enough snag replacement trees to maintain the habitat for 20 percent of the cavity nester population potential.

20. Run-6

a. Purpose and Background

1) This is one of the economic benchmarks required by the Regulations (36 CFR 219.12(E)(1)(iii)(c)).

2) When this run is compared to Run-4, the Forest can show the opportunity costs of imposing NDF given an objective function of maximum PNV (assigned values) subject to sequential upper and lower bounds, floors, ceilings, MMRs, and ending inventory constraints.

b. Formulation

1) Objective Function- Maximize PNV for 15 decades (assigned values)

2) Land Base- All suitable and available CFL's are available for programmed timber harvesting. Special prescriptions are assigned to intensive recreation, and the MMR bald eagle and spotted owl areas

3) Constraints-

a) NDF at or below the LRSY

b) General Forest rotations based on economic criteria as opposed to 95 percent CMAI

c) Ending inventory constraint

d) Upper limit rate of harvesting constraints in bald eagle and spotted owl MMR areas

e) Upper limit rate of harvesting constraints in intensive recreation areas to achieve visual objectives

f) Upper limit dispersion constraints of 58 percent in General Forest

g) Lower limit inventory constraints for mature and overmature sawtimber to meet the MMR requirements for goshawks, pine martens, and three-toed-woodpeckers.

4) Yield Tables- Yield tables reflect volume reductions to account for enough snag replacement trees to maintain the habitat for 20 percent of the cavity nester population potential.

21. Run-7

a. Purpose and Background

1) This is one of the economic benchmarks required by the Regulations (36 CFR 219.12(E)(1)(iii)(b)).

2) When this run is compared to Run-6, the Forest can show the opportunity costs of rotations restricted to 95 percent of CMAI given an objective function of maximum PNV (assigned values) subject to sequential upper and lower bounds, floors, ceilings, MMR's, and ending inventory constraints.

3) When compared to Run-5, the Forest can show the opportunity costs of NDF given an objective function of maximum PNV (assigned values) and subject to rotations based on 95 percent CMAI, MMR's, and ending inventory constraints.

4) When compared to Run-3, the Forest can show the opportunity costs of the combination of MMR's given an objective function of maximum PNV (assigned values) and subject to NDF, rotations based on 95 percent CMAI, and ending inventory constraints.

5) When compared to Run-4, the Forest can show the opportunity costs of NDF in concert with rotations restricted to 95 percent of CMAI.

b. Formulation

1) Objective Function- Maximize PNV for 15 decades (assigned values)

2) Land Base- All suitable and available CFL's are available for programmed timber harvesting. Special prescriptions are assigned to intensive recreation, and the MMR bald eagle and spotted owl areas

3) Constraints-

a) NDF at or below the LRSY

b) General Forest rotations based on 95 percent CMAI

c) Ending inventory constraint

d) Upper limit rate of harvesting constraints in bald eagle and spotted owl MMR areas

e) Upper limit rate of harvesting constraints in intensive recreation areas to achieve visual objectives

f) Upper limit dispersion constraints of 58 percent in General Forest

g) Lower limit inventory constraints for mature and overmature sawtimber to meet the MMR requirements for goshawks, pine martens, and three-toed-woodpeckers.

4) Yield Tables- Yield tables reflect volume reductions to account for enough snag replacement trees to maintain the habitat for 20 percent of the cavity nester population potential.

22. Run-8

a. Purpose and Background

1) This is one of the economic benchmarks required by the Regulations (36 CFR 219.12(E)(1)(iii)(a)).

2) This run is similar to Run-4, except that these PNV calculations are based on market values only as opposed to market plus assigned. When this run is compared to Run-4, the Forest can show the differences that result from maximum PNV objective functions based on market values only, as opposed to market plus assigned.

b. Formulation

1) Objective Function- Maximize PNV for 15 decades (market values)

2) Land Base- All suitable and available CFL's are available for programmed timber harvesting. Special prescriptions are assigned to the MMR bald eagle and spotted owl areas

3) Constraints-

a) Departure from NDF based on 25 percent sequential upper and lower bounds and a 15 decade 316 MMCF floor (80 percent of current harvest levels)

b) General Forest rotations based on economic criteria (i.e., short of 95 percent CMAI)

c) Ending inventory constraint

d) Upper limit rate of harvesting constraints in bald eagle and spotted owl MMR areas

e) Upper limit dispersion constraints of 58 percent in General Forest

f) Lower limit inventory constraints for mature and overmature sawtimber to meet the MMR requirements for goshawks, pine martens, and three-toed-woodpeckers.

4) Yield Tables- Yield tables reflect volume reductions to account for enough snag replacement trees to

maintain the habitat for 20 percent of the cavity nester population potential

23. Run-9

a. Purpose and Background

1) This is one of the economic benchmarks required by the Regulations (36 CFR 219.12(E)(1)(iii)(c)).

2) When this run is compared to Run-8, the Forest can show the opportunity costs of restricting rotations to 95 percent of CMAI given an objective function of maximum PNV (market values) subject to sequential upper and lower bounds, floors, ceilings, MMR's, and ending inventory constraints.

3) When compared to Run-5, the Forest can show the differences that result from the maximum PNV (assigned values) as compared to the maximum PNV (market values).

b. Formulation

1) Objective Function- Maximize PNV for 15 decades (market values)

2) Land Base- All suitable and available CFL's are available for programmed timber harvesting. Special prescriptions are assigned to the MMR bald eagle and spotted owl areas

3) Constraints-

a) Departure from NDF based on 25 percent sequential upper and lower bounds and a 15 decade 316 MMCF floor (80 percent of current harvest levels)

b) General Forest rotations based on 95 percent CMAI

c) Ending inventory constraint

d) Upper limit rate of harvesting constraints in bald eagle and spotted owl MMR areas

e) Upper limit dispersion constraints of 58 percent in General Forest

f) Lower limit inventory constraints for mature and overmature sawtimber to meet the MMR requirements for goshawks, pine martens, and three-toed-woodpeckers.

4) Yield Tables- Yield tables reflect volume reductions to account for enough snag replacement trees to maintain the habitat for 20 percent of the cavity nester population potential.

24. Run-10

a. Purpose and Background

1) This is one of the economic benchmarks required by the Regulations (36 CFR 219.12(E)(1)(iii)(c)).

2) When this run is compared to Run-8, the Forest can show the opportunity costs of imposing NDF given an objective function of maximum PNV (market values) subject to sequential upper and lower bounds, floors, ceilings, MMRs, and ending inventory constraints

3) When compared to Run-6, the Forest can show the differences that result from a maximum PNV objective function based on market values only as opposed to market plus assigned

b. Formulation

1) Objective Function- Maximize PNV for 15 decades (market values)

2) Land Base- All suitable and available CFL's are available for programmed timber harvesting. Special prescriptions are assigned to the MMR bald eagle and spotted owl areas

3) Constraints-

a) NDF at or below the LRSY

b) General Forest rotations based on economic criteria as opposed to 95 percent CMAI

c) Ending inventory constraint

d) Upper limit rate of harvesting constraints in bald eagle and spotted owl MMR areas

e) Upper limit dispersion constraints of 58 percent in General Forest

f) Lower limit inventory constraints for mature and overmature sawtimber to meet the MMR requirements for goshawks, pine martens, and three-toed-woodpeckers.

4) Yield Tables- Yield tables reflect volume reductions to account for enough snag replacement trees to maintain the habitat for 20 percent of the cavity nester population potential.

25. Run-11

a. Purpose and Background

1) This is one of the economic benchmarks required by the Regulations (36 CFR 219.12(E)(1)(iii)(a)).

2) When this run is compared to Run-10, the Forest can show the opportunity costs of rotations restricted to 95 percent of CMAI given an objective function of maximum PNV (market values) subject to NDF, MMRs, and ending inventory constraints.

3) When compared to Run-9, the Forest can show the opportunity costs of NDF given an objective function of max PNV (market values) and subject to rotations based on 95 percent CMAI, MMR's, and ending inventory constraints.

4) When compared to Run-7, the Forest can show the differences that result from a maximum PNV objective function based on market values only as opposed to market plus assigned values

b. Formulation

1) Objective Function- Maximize PNV for 15 decades (market values)

2) Land Base- All suitable and available CFL's are available for programmed timber harvesting. Special prescriptions are assigned to the MMR bald eagle and spotted owl areas

3) Constraints-

a) NDF at or below the LRSY

b) General Forest rotations based on 95 percent CMAI

c) Ending inventory constraint

d) Upper limit rate of harvesting constraints in bald eagle and spotted owl MMR areas

e) Upper limit dispersion constraints of 58 percent in General Forest

f) Lower limit inventory constraints for mature and overmature sawtimber to meet the MMR requirements for goshawks, pine martens, and three-toed-woodpeckers.

4) Yield Tables- Yield tables reflect volume reductions to account for enough snag replacement trees to maintain the habitat for 20 percent of the cavity nester population potential.

26. Maximum Timber Resource (Preliminary to Subsequent Rollover Run)

a. Purpose and Background

1) This is one of the benchmarks required by the regulations (36 CFR 219.12(e)(1)(ii)) used to establish maximum resource levels.

2) When compared to Run-1, the Forest will be able to assess the impacts of the MMR's on the timber biological potential.

b. Formulation

1) Objective Function- Maximize timber volume for 15 decades

2) Land Base- All suitable and available CFL's are allocated to General Forest except the MMR bald eagle and spotted owl areas which are allocated to T&E prescriptions

3) Constraints-

a) NDF at or below the LRSY

b) General Forest rotations based on 95 percent CMAI

        c) Ending inventory constraint

        d) Upper limit rate of harvesting constraints in bald eagle and spotted owl MMR areas

        e) Upper limit dispersion constraints of 58 percent in General Forest

        f) Lower limit inventory constraints for mature and overmature sawtimber to meet the MMR requirements for goshawks, pine martens, and three-toed-woodpeckers.

    4) Yield Tables- Yield tables reflect volume reductions to account for enough snag replacement trees to maintain the habitat for 20 percent of the cavity nester population potential.

27. Maximum Timber Resource (PNV Rollover Run)

  a. Purpose and Background

    1) This is one of the benchmarks required by the regulations (36 CFR 219.12(e)(1)(ii)) used to establish maximum resource levels.

    2) When compared to Run-1, the Forest will be able to assess the impacts of the MMRs on the timber biological potential.

  b. Formulation

    1) Objective Function- Maximize PNV for 15 decades (Market Values)

    2) Land Base- All suitable and available CFL lands are allocated to General Forest except the MMR bald eagle and spotted owl areas which are allocated to T&E prescriptions

    3) Constraints-

        a) NDF at or below the LRSY

        b) Lower limit constraints to at least meet the timber outputs from the previous run

        c) General Forest rotations based on 95 percent CMAI

        d) Ending inventory constraint

e) Upper limit rate of harvesting constraints in bald eagle and spotted owl MMR areas

f) Upper limit dispersion constraints of 58 percent in General Forest

g) Lower limit inventory constraints for mature and overmature sawtimber to meet the MMR requirements for goshawks, pine martens, and three-toed-woodpeckers.

4) Yield Tables- Yield tables reflect volume reductions to account for enough snag replacement trees to maintain the habitat for 20 percent of the cavity nester population potential.

28. Maximum Visual Resource

a. Purpose and Background

1) This is one of the benchmarks required by the regulations (36 CFR 219.12(e)(1)(ii)) used to establish maximum resource levels.

2) When compared to Run-11, the Forest will be able to assess the timber related tradeoffs associated with managing the Forest to achieve its maximum visual quality.

b. Formulation

1) Objective Function- Maximize PNV for 15 decades (market values)

2) Land Base- All suitable and available CFL lands are available for programed timber harvesting. All important visual areas are assigned to scenic view management area prescriptions. The remainder of the tentatively suitable and available CFL's are allocated to General Forest except that T&E prescriptions are assigned to the MMR bald eagle and spotted owl areas

3) Constraints-

a) NDF at or below the LRSY

b) General Forest rotations based on 95 percent CMAI

c) Ending inventory constraint

d) Upper limit rate of harvesting constraints in bald eagle and spotted owl MMR areas

e) Upper limit dispersion constraints of 58 percent in General Forest

f) Lower limit inventory constraints for mature and overmature sawtimber to meet the MMR requirements for goshawks, pine martens, and three-toed-woodpeckers.

g) Upper limit scheduled output constraints on the proportion of an area that can be in harvest created openings are applied to all visual allocations in order to help achieve the desired visual management objectives

4) Yield Tables- Yield tables reflect volume reductions to account for enough snag replacement trees to maintain the habitat for 20 percent of the cavity nester population potential.

## 29. Maximum Recreation Resource

### a. Purpose and Background

1) This is one of the benchmarks required by the regulations (36 CFR 219.12(e)(1)(ii)) used to establish maximum resource levels.

2) When compared to the Maximum Timber Benchmark (rollover), the Forest will be able to assess the timber related tradeoffs associated with managing the Forest to achieve its maximum potential to supply recreation opportunities.

### b. Formulation

1) Objective Function- Maximize PNV for 15 decades (market values)

2) Land Base- All suitable and available CFL lands are available for programmed timber harvesting. All important developed and undeveloped recreation areas are assigned to recreation management area prescriptions. All important viewsheds are assigned to scenic view management area prescriptions. Deer Habitat is managed to achieve large herd sizes for

hunting purposes. The remainder of the tentatively suitable and available CFL's are allocated to General Forest except the MMR bald eagle and spotted owl areas which are allocated to T&E prescriptions

3) Constraints-

a) NDF at or below the LRSY

b) General Forest rotations based on 95 percent CMAI

c) Ending inventory constraint

d) Upper limit rate of harvesting constraints in bald eagle and spotted owl MMR areas

e) Upper limit dispersion constraints of 58 percent in General Forest

f) Lower limit inventory constraints for mature and overmature sawtimber to meet the MMR requirements for goshawks, pine martens, and three-toed-woodpeckers.

g) Upper limit scheduled output constraints on the proportion of an area that can be in harvest created openings are applied to all visual and intensive recreation allocations in order to help achieve the desired visual management objectives

h) Constraints for thermal cover conditions are applied to deer winter range allocations

4) Yield Tables- Yield tables reflect volume reductions to account for enough snag replacement trees to maintain the habitat for 20 percent of the cavity nester population potential

30. Maximum Wildlife Resource

a. Purpose and Background

1) This is one of the benchmarks required by the regulations (36 CFR 219.12(e)(1)(ii)) used to establish maximum resource levels.

2) When compared to the Maximum Timber Benchmark (Rollover), the Forest will be able to assess the timber related tradeoffs associated with managing the

Forest to achieve its maximum potential to supply wildlife habitat needs.

b. Formulation

1) Objective Function- Maximize PNV for 15 decades (market values).

2) Land Base- All suitable and available CFL's are available for programmed timber harvesting. All inventoried deer winter range, bald eagle, spotted owl, and osprey areas are allocated to their respective management prescriptions. The remainder of the tentatively suitable and available CFL's are allocated to General Forest

3) Constraints-

a) NDF at or below the LRSY

b) General Forest rotations based on 95 percent CMAI

c) Ending inventory constraint

d) Upper limit rate of harvesting constraints in bald eagle and spotted owl areas

e) Upper limit dispersion constraints of 58 percent in General Forest

f) Lower limit inventory constraints for mature and overmature sawtimber to meet the MMR requirements for goshawks, pine martens, and three-toed-woodpeckers.

h) Constraints for thermal cover conditions are applied to deer winter range allocations

4) Yield Tables- Yield tables reflect volume reductions to account for enough snag replacement trees to maintain the habitat for 80 percent of the cavity nester population potential

## D. Benchmark Analysis Results

The significant findings of the benchmark analyses are discussed in this section. The focus will be upon information provided by the benchmarks with regards to market and nonmarket resource production relationships, economic tradeoffs, constraint analyses, and the implications concerning the decision space within which alternatives may subsequently be developed in order to address the planning ICO's. It is formated in such a way as to satisfy the May 17th Appendix B outline for Chapter VI, Sections D, E, and F.

As mentioned above, a series of required and optional benchmarks were developed and analyzed in accordance with the Regional Planning Direction (November 10, 1983). The purposes and formulations for 30 of the key benchmarks are presented in the previous section of this chapter. For discussion purposes, the benchmark results displayed in this section will be grouped into the following analysis topics:

1. Biological Potential
2. Economic Potential
3. Minimum Management Requirements (MMR's)
4. Price Trends
5. Cost Sensitivity
6. Policy Constraints
7. Resource Maximization Potentials

Benchmark runs which are specifically described in the Regional Planning Direction package will be referred to by their run numbers in that package. This should facilitate ease of discussion and comparison between Forests within the Region. Finally, the summary will be concluded with a table which summarizes the relevant outputs and effects pertaining to some of the key required benchmarks.

1. Biological Potential

This discussion pertains primarily to Run-1 of the benchmarks. However, additional runs were made to supplement the analysis. Table B-VI-1 below portrays the timber biological transition between the comparable analysis performed for the 1982 DEIS and the current benchmark analyses.

Table B-VI-1 Comparison of Biological Potential Estimates

| | ASQ(MMCF/DEC) | LRSY(MMCF/DEC) |
|---|---|---|
| Bio. Potential (1982 DEIS) | 571.4 | 612.6 |
| Bio. Potential (1985 DEIS) | 534.0 | 534.0 |

Two results deserve attention. First, in 1982 the Forest was modeled as a deficit old growth Forest in which the long run sustained yield (LRSY) constraint was not binding, or holding down, the allowable sale quantity (ASQ). Under that type of unit size/dispersion. We will discuss the wildlife MMR's first. Run-3 will be used as the base to compare against since its NDF harvest schedule was comparable to the formulations used to analyze the MMRs.

Our first step was to compare the dedicated versus the managed approach for meeting the MMR's for bald eagles, spotted owls, goshawks, pine martens, three-toed-woodpeckers, and other wildlife species. The dedicated approach resulted in a 5.9 percent drop in the timber PNV and a 5.0 percent reduction in the ASQ/LRSY when compared to Run-3. The managed approach was less impactful, resulting in 4.2 percent and 2.7 percent drops, respectively. The results are displayed in Table B-VI-3 below.

Table B-VI-3 Analysis of Dedicated vs Managed Wildlife MMR's

| | ASQ/LRSY(MMCF/DEC) | TIMBER PNV($MM) |
|---|---|---|
| Max PNV Base (Run-3) | 512.3 | 1133.3 |
| Dedicated WL MMRs (Run-3a) | 486.6 (-5.0%) | 1066.7 (-5.9%) |
| Managed WL MMR's (Run-3b) | 498.3 (-2.7%) | 1086.2 (-4.2%) |

The next step was to examine the tradeoffs associated with the individual wildlife MMR constraint sets. Since the managed approach was less impactful on PNV and the ASQ/LRSY when all wildlife species were considered, the tradeoffs analyzed for the individual species were also based on the managed approach. Table B-VI-4 displays the results.

Table B-VI-4 Wildlife MMR Tradeoffs For Individual Species

| | ASQ/LRSY(MMCF | Timber PNV($MM) |
|---|---|---|
| Max PNV Base (Run-3) | 512.3 | 1133.3 |
| Bald Eagle MMR's (Run-3c) | 506.0 (-1.2%) | 1118.7 (-1.3%) |
| Spotted Owl MMR's (Run-3d) | 507.8 (-0.9%) | 1123.4 (-0.9%) |
| 3-Toed, Pine Marten, Goshawk (Run-3e) | 512.6 (+0.1%) | 1132.5 (-0.1%) |
| Cavity Nester MMR's (Run-3f) | 504.6 (-1.5%) | 1110.2 (-2.0%) |
| Total Wildlife MMR's (Run-3b) | 498.3 (-2.7%) | 1086.2 (-4.2%) |

The cavity nester MMR's (woodpeckers) are the most impactful on both the ASQ/LRSY and the PNV. Bald Eagles resulted in the second largest tradeoffs. Least impactful were the MMR's for three-toed-woodpeckers, pine martens, and goshawks which were analyzed collectively. Finally, note that the tradeoffs associated with the individual MMR's are not additive. The sum of the individuals do not add up to the tradeoffs when all the

534.0 MMCF is attributable to the 1984 Act. The remainder is due to the less productive managed yield tables.

2. Economic Potential

Run-2 and Run-3 of the benchmark analyses were used to explore the timber related economic potentials of the Forest. As described in the previous section, Run-2 permits the harvest schedule to depart from NDF by using 25 percent sequential upper and lower bounds and a harvest floor equal to 80 percent of the current harvest levels. As such, it represents the maximum timber related PNV unconstrained by MMR's or any other multiple resource considerations. Run-3 of the benchmarks is similar to Run-1 except that the objective function is changed to maximize present net value of timber from maximize timber. The results are presented in Table B-VI-2 below.

Table B-VI-2 Unconstrained Timber Related Economic Potentials

| | ASQ(MMCF/DEC) | LRSY(MMCF) | PNV($MM) |
|---|---|---|---|
| Max Timber (Run-1) | 534.0 | 534.0 | 825.9 |
| Max PNV (Run-2) | 994.6 | 454.6 | 1285.7 |
| Max PNV (Run-3) | 512.3 | 512.3 | 1133.3 |

Several findings deserve attention. The obvious are the much higher PNVs which occur under the present net value objective functions in Runs 2 and 3 as opposed to the maximize volume objective function of Run-1. In addition, the departure harvest schedule in Run-2 allows it to generate a 13.4 percent higher PNV than that produced under NDF in Run-3.

While the PNVs associated with Runs 2 and 3 are higher than that of Run-1, the LRSY's are lower, as would be expected. The economic objective functions traded off LRSY volume for a more valueable species mix in order to maximize PNV. In other words, they changed the priority of stands selected for harvesting, opting for more of the higher valued ponderosa pine stands earlier as opposed to the lower valued lodgepole, mixed conifer, and mountain hemlock that were selected in the early decades under the volume maximization objective function.

3. Analysis of MMR's

Two types of MMR's were analyzed. The first were those dealing with wildlife and the second were those dealing with characterization of existing inventory and future growth potential, the base sales schedule (BSS), which is a nondeclining flow (NDF) timber harvest schedule, stair steps up to the LRSY by the 12th or 13th decade out in the future.

However, the current formulation characterizes the Deschutes as a surplus Forest in which the LRSY is binding on the ASQ. The BSS is flat and equal to the LRSY. If the LRSY was not set as an upper bound constraint on the harvest levels, the ASQ would actually be higher than the LRSY.

The change from a deficit to a surplus Forest is mostly attributable to the recalculated managed yield tables. On the average, the new yield tables are 14.9 percent less productive than the managed yield tables used to portray future growth potentials for the 1982 DEIS. On the other hand, estimates of the existing standing inventory between the two DEISs are approximately equal. The reduced estimated future growth potential of the managed stands compared to the relatively comparable approximations of existing inventory has been the primary cause of the transition from a deficit to a surplus old growth Forest.

From a harvest scheduling standpoint, the differences between a surplus and an deficit old growth Forest have significant implications regarding the intensity and timing choices of timber prescriptions selected by FORPLAN. On a deficit Forest, rotations short of CMAI can have a positive effect on the ASQ level because the higher yielding managed stands are brought into production earlier. However, on a surplus Forest, rotations short of CMAI are not often selected because of their downward pressure on the LRSY and, consequently, the ASQ. More detail on the relationship between rotation lengths, the ASQ, and the LRSY will be presented in the discusion of the Maximum PNV Benchmarks (Runs 8 through 11).

The second result which deserves some attention is the decrease in both the ASQ and the LRSY since the 1982 DEIS. Some of the decline is due to the reduction in land base resulting from the Oregon Wilderness Act of 1984, and some is due to the less productive managed yield tables. An optional run was done in which the land base was increased by adding ack the suitable and available commercial forest lands (CFL) which were removed from the base as a result of the Oregon Wilderness Act of 1984. The resulting ASQ/LRSY was equal to 552.8 MMCF/decade. From this we can say that approximately 50 percent of the drop in the ASQ from 571.4 MMCF to 534.0 MMCF, and 25 percent of the decline in the LRSY from 612.6 MMCF to wildlife MMR's are examined collectively. This reflects the fact that there is some overlap in the conditions needed to the meet the habitat requirements for the different wildlife MMRs.

The second set of MMR constraints analyzed were those dealing with the legal requirements for unit sizes and dispersion between units (i.e., a logical harvest unit). It is important to keep in mind that the Deschutes did not use these constraints as surrogates for any other resource management objectives such as cover, sedimentation control, or whatever. The constraints are designed to result in 40 acre average unit sizes with logical harvest units between them.

The nebulous term involved here is "logical harvest unit". On the Deschutes, better than 90 percent of the suitable and available Forest land can be tractor logged. This gives the Forest quite a bit more flexibility in designing leave strips which at some time in the future will be logical harvest units.

For this analysis, we examined three different proportion constraint levels which would be applied to the General Forest Management Area in order to meet the legal requirements for unit size/dispersion. The 30 percent proportion was analyzed because it is the constraint that was used in the 1982 DEIS. The next two proportion constraint levels were based on some more recent mapping analysis regarding this MMR. The 46 percent constraint represents 40 acre units with 630 foot leave strips between the units. The 58 percent constraint reflects 40 acre units with 420 foot leave strips. The percent indicates the maximum proportion of an area (almost at the analysis area level) which can be in harvest created openings at any one time. A harvest unit remains an opening for one decade. The tradeoffs are presented in Table B-VI-5 below.

Table B-VI-5 Comparison of Alternative Unit Size/Dispersion MMR Constraints

| | ASQ/LRSY(MMCF) | Timber PNV($MM) |
|---|---|---|
| Max PNV Base (Run-3) | 512.3 | 1133.3 |
| 30% Area Constraint (Run-3g) | 481.4 (-6.0%) | 1080.1 (-4.7%) |
| 46% Area Constraint (Run-3h) | 516.5 (+0.8%) | 1111.2 (-2.0%) |
| 58% Area Constraint (Run-3i) | 523.3 (+2.1%) | 1121.1 (-1.1%) |

In terms of present net value, the 58 percent dispersion constraint was less binding; as you would expect. The surprising increase in the ASQ/LRSY is due to fewer economically unsuited acres and slightly more intensive silviculture associated with the larger proportion constraints.

Unit size/dispersion constraints were analyzed one more way. Forty acre units were laid out on a computer grid map of the FORPLAN analysis areas. Twenty to 40 acre logical harvest units were left between the harvest units planned for the current decade. The resulting proportion of the area that could be harvested ranged from 48 percent to 50 percent depending on the shape and size of the analysis areas for the small portions of the Forest examined. Therefore, it seemed reasonable that either the 46 percent or 58 percent dispersion constraints would satisfy the intent of this MMR.

Finally, the combined impacts of both the wildlife and dispersion MMR's on PNV and the ASQ/LRSY were evaluated. Table B-VI-6 depicts the results of this tradeoff analysis.

Table B-VI-6 Combined Tradeoffs of Both Wildlife & Dispersion MMR's

|  | ASQ/LRSY(MMCF) | Timber PNV($MM) |
|---|---|---|
| Max PNV Base (Run-3) | 512.3 | 1133.3 |
| All Wildlife MMR's (Run-3b) | 498.3 (-2.7%) | 1086.2 (-4.2%) |
| 58% Dispersion MMR's (Run-3i) | 523.3 (+2.1%) | 1121.1 (-1.1%) |
| All MMR's (Run-11) | 505.7 (-1.3%) | 1077.2 (-5.0%) |

### 4. Analysis of Price Trends

It is Regional Direction to use a 1 percent per year real price trend for stumpage and 0 percent for all other resource values and costs. It is also Regional Direction to perform a sensitivity analysis on the price trends so that the implications of the direction can be better understood. For that purpose, Run-3 (Max PNV Base) was run with alternative stumpage price trends of 0, 2, and 3 percent (Run-3 uses a 1 percent trend). The results of this analysis are some of the most complex to understand, and in some cases counter intuitive, of any of the benchmark analyses performed. Some of the runs were redone to verify their accuracy. The results are displayed in the Table B-VI-7 below.

Table B-VI-7 Analysis of Alternative Price Trends

| | PNV ($MM) | ASQ/LRSY (MMCF) | PPN DEC.1-3 (MMCF) | PCT DEC.1-5 (M ACRES) | ECON. UNSUIT. (M ACRES) |
|---|---|---|---|---|---|
| 0% Trend (RUN-31) | 916.6 | 523.6 | 1100.9 | 31.0 | 8.9 |
| 1% Trend (Run-3) | 1133.3 | 512.3 | 1065.2 | 29.6 | 34.9 |
| 2% Trend (Run-3m) | 1431.9 | 510.9 | 955.5 | 112.0 | 27.9 |
| 3% Trend (Run-3n) | 1886.3 | 510.8 | 798.7 | 272.8 | 10.1 |

Some of the results are not surprising at all. As the price trend is increased, the present net value of the timber resource increases. The model also selects more intensive silvicultural prescriptions as is evident in the amount of precommercial thinning that is scheduled during the first five decades. The more intensive prescriptions often have a higher contribution to long run sustained yield (i.e., higher culmination at mean annual increment (CMAI) but a somewhat lower per acre present net value due to the early investments in stocking level control. As the price trend increases, these investments become more attractive. Also, as the price trend increases, the harvesting of ponderosa pine is delayed and substituted for with the lower valued mixed conifer and lodgepole pine stands. With higher price trends it pays to hold the more valuable ponderosa pine on the stump due to the net effects of price trends, net growth per acre, and the discount rate.

Some of the other results are more complex to explain. In moving from a 1 percent price trend to a 3 percent trend, the amount of acres determined to be economically unsuitable decreases. The higher price trends help to overcome the relatively less desirable economics associated with some of the economically marginal lodgepole and mountain hemlock acres. However, just the opposite occurs in moving from a 0 to a 1 percent price trend. The 0 percent price trend has fewer unsuitable acres. There appears to be a very fine line between the contribution these marginal acres make to the timber present net value versus the LRSY (Which is directly related to the ASQ on a surplus Forest). Apparently, the contribution these acres make to the LRSY (therefore allowing the harvest of more ponderosa and mixed conifer stands earlier in the harvest scheduling horizon) outweighs the negative per acre values associated with the marginal stands involved.

As should be evident, the implications associated with the use of different price trends can be quite complex. It would be desirable to test the sensitivity of the preferred alternative to different price trend assumptions.

### 5. Cost Sensitivity

Another sensitive issue in this round of Forest Planning pertains to the costs which different Forests are using for their economic analyses. In order to shed some light on the relevance of this topic, an across the board plus and minus 20 percent cost sensitivity analysis was performed. Additional costs analyses should be done during the implementation/monitoring phase. The results from this are displayed below in Table B-VI-8. There are no surprises. If costs were really 20 percent higher than we are using in the benchmark analyses, more acres would be economically unsuitable, the ASQ/LRSY would drop, and present net value would be lower. The opposite effects would occur if the costs were really 20 percent lower. Other factors such as silvicultural intensity are also affected. Higher costs render timber stand improvement (TSI) investments even less desirable.

Table B-VI-8 Cost Sensitivity Analysis

| | ASQ/LRSY(MMCF) | Timber PNV($MM) | UNECON. ACRES |
|---|---|---|---|
| Max PNV Base (Run-3) | 512.3 | 1133.3 | 34,853 |
| Costs Plus 20% (Run-3j) | 507.9 (-0.9%) | 1078.0 (-4.9%) | 42,495 |
| Costs Minus 20% (Run-3k) | 524.6 (+2.4%) | 1181.5 (+4.3%) | 8,382 |

### 6. Analysis of Policy Constraints

Several FORPLAN runs were executed to help analyze the implications of the nondeclining flow and CMAI rotation age policy constraints. These runs are described in the Regionial Direction package as Runs 8, 9, 10 and 11. The present net worth calculations include only market values (timber). The constraints to meet the minimum management requirements (MMR's) are also included in these runs. In examining the results, it helps to focus on only two runs at a time even though all the results are presented in Table B-VI-9.

Table B-VI-9 Analysis of NDF & CMAI Policy Constraints

| | Timber PNV ($MM) | ASQ (MMCF) | LRSY (MMCF) | UNECON. ACRES |
|---|---|---|---|---|
| Run-8(DEP,UTIL) | 1203.6 | 938.9 | 439.8 | 19,534 |
| Run-9(DEP,95% CMAI) | 1200.9 | 929.4 | 453.8 | 15,948 |
| Run-10(NDF,UTIL) | 1074.0 | 504.8 | 504.8 | 10,369 |
| Run-11(NDF,95%CMAI) | 1077.2 | 505.7 | 505.7 | 9,048 |

By comparing Run-8 to Run-9, we can examine the effects of permitting rotation ages short of CMAI under a departure from nondeclining yield. We will refer to the prescriptions with short rotation ages as utilization prescriptions since they permit FORPLAN to begin considering regeneration harvest of a stand as soon as a minimum diameter (d.h.b.) of 7 inches is achieved, as opposed to delaying the regeneration options until the stand has reached CMAI. The departure from nondeclining yield permitted the harvest schedule to vary up and down by as much as 25 percent from one decade to the next (i.e., sequential upper and lower bounds of 25 percent). It is important to keep in mind that under these departure formulations, there is no direct linkage constraint between LRSY and the ASQ as there is under the nondeclining flow runs.

Since the economic culmination of a stand occurs before the biological culmination, utilization prescriptions give the FORPLAN model regeneration harvest timing choices which include both the economic and the production optima. In contrast, the 95 percent CMAI prescriptions do not provide the Model with final harvest timing choices which include the economic culmination age. Since in both Run-8 and Run-9 there is no link between LRSY and the ASQ, the Model is more concerned with harvesting stands closer to their economic optima at the expense of a higher biological production rate. This is why Run-8 has a higher PNV and ASQ, but a lower LRSY. It also didn't need quite as many acres to achieve its objective of maximizing present net worth.

By comparing Run-8 and Run-10, we can examine the effects of imposing a nondeclining flow constraint. Both runs permit rotation ages short of 95 percent CMAI. The effect of the nondeclining flow constraint on a surplus old growth Forest is to force the FORPLAN model to select longer average rotation ages than it could use under departure. The longer rotation ages are further from the economic optima but closer to the wood fiber production optima. Also, on a surplus

Forest under nondeclining flow constraints, the LRSY is binding on the ASQ (i.e. holding it down). Therefore, the Model is in the position of having to juggle rotation ages somewhere between the economically optimal timing choice and the CMAI age. In doing so it often treats the working groups differently depending on their relative contributions to PNV versus LRSY. For example, a working group with a relatively low economic value but high wood fiber production rate may be harvested close to its CMAI age due to its contribution to LRSY (which is directly linked to the ASQ, and therefore effects PNV indirectly). On the other hand, a working group composed of relatively high valued species may be scheduled for harvest closer to its economic culmination for its contribution to PNV, but at the expense of a lower contribution to LRSY.

This is essentially what happened in Run-10 as compared to Run-8. The average rotation ages are longer in Run-10, but vary somewhere between the economic optima and production optima depending on the working group (i.e., higher valued ponderosa and mixed conifer stands versus lower valued lodgepole and mountain hemlock). The longer average rotation age (closer to CMAI) resulted in a higher LRSY. However, the LRSY is holding down the ASQ. The lower early decade harvest levels in Run-10 consequently lead to a significant drop in the PNV. Apparently, fewer acres were dropped out of the solution due to poor economic returns due to their contribution to LRSY.

In comparing Run-9 to Run-11, a similar analysis is performed except the FORPLAN model can not begin to consider final harvest options until the stands have achieved 95 percent CMAI. By forcing the model to delay regeneration harvest choices until at least 95 percent CMAI is achieved, the long run sustained yields are slightly higher than if the Model could consider final harvest closer to economic culmination. Again, the nondeclining yield run keeps more acres in the timber base due to their contribution to LRSY.

Finally, Run-10 and Run-11 are compared. Both runs are subject to nondeclining flow constraints. Run-10 permits harvest short of CMAI, while Run-11 does not. Theoretically, rotation lengths short of CMAI do no not have much effect on the ASQ or PNV on a surplus old growth Forest under nondeclining flow. These two runs basically substantiate this. Their outputs and effects are nearly identical. While Run-10 permits a wider age range of regeneration timing choices, it only considers final harvest every other decade once the utilization sizes are reached (due to Version I, Model I limitations). Any slight differences between the two runs can be attributed to these differences.

## 7. Resource Maximization Potentials

Several benchmark runs were made in order to explore the maximum potentials of the Forest to produce various outputs. These outputs include present net value, range, recreation, timber, visual quality, and wildlife. In addition to helping define the maximum resource production capabilities of the Forest and the decision space within which alternatives can be developed to address the planning ICO's, some idea can be obtained about the magnitude of output tradeoffs that are incurred when various resources are emphasized.

Except for Runs 4 and 7 (Max PNV), and the Maximum Timber Benchmark, the analysis was performed by providing FORPLAN with the land allocations and prescriptions which would lead to the maximization of a particular resource (i.e., recreation, or visuals, or wildlife). FORPLAN was then run with a maximum present net value objective function. On the other hand, the Maximum Timber Benchmark was first run with a maximize timber objective function. The timber outputs from this run were then "rolled over" to a second run which was executed with a maximum present net value objective function.

The recreation and range outputs and their associated discounted benefits were calculated with electronic spreadsheets outside of FORPLAN. The budget estimations and the overall present net value calculations were also performed with the use of electronic spreadsheets.

Table B-VI-10 displays the outputs and effects associated with the various resource maximization benchmarks. With regard to the discounted benefits, the timber resource accounts for 50 to 80 percent of the totals, while recreation contributes from 20 to 45 percent to the totals. Special use permits and range usually account for less than 10 percent. The importance of the recreation values on the Deschutes should not be overlooked. In fact, the two maximum present net value benchmarks (Run-4 and Run-7) achieved their objectives by allocating 70,000 acres of forested lands to an intensive recreation emphasis due to relative tradeoffs between the recreation and timber values on those acres.

TABLE B-VI-10 Outputs and Effects of Required Benchmark Analyses

| | Minimum Level | Max. PNV Dep.+Util (Run-4) | Max. PNV NDF-CMAI (Run-7) | Max. Timber | Max. Range | Max. Wildlife | Max. Visual | Max. Recreation |
|---|---|---|---|---|---|---|---|---|
| Discounted Benefits ($MM): | | | | | | | | |
| --Timber | 0.0 | 1217.7 | 1053.6 | 1060.3 | 1060.3 | 992.1 | 964.7 | 858.1 |
| --Recreation | 160.7 | 773.6 | 773.6 | 409.9 | 409.9 | 217.2 | 409.9 | 776.9 |
| --Range | 0.0 | 6.8 | 6.8 | 6.8 | 10.5 | 3.7 | 5.6 | 5.6 |
| --Special uses | 0.0 | 20.3 | 20.3 | 20.3 | 20.3 | 20.3 | 20.3 | 20.3 |
| Discounted Costs ($MM) | 119.0 | 516.8 | 434.2 | 521.2 | 521.2 | 389.6 | 381.9 | 416.4 |
| PNV ($MM) | 41.7 | 1501.6 | 1420.1 | 976.1 | 979.88 | 843.7 | 1018.6 | 1244.5 |
| Harvest Levels (MMCF): | | | | | | | | |
| --Decade 1 | | 938.9 | 505.7 | 517.8 | 517.8 | 450.8 | 455.4 | 402.7 |
| --Decade 2 | | 704.2 | 505.7 | 517.8 | 517.8 | 450.8 | 455.4 | 402.7 |
| --Decade 3 | | 528.1 | 505.7 | 517.8 | 517.8 | 450.8 | 455.4 | 402.7 |
| --Decade 4 | | 396.1 | 505.7 | 517.8 | 517.8 | 450.8 | 455.4 | 402.7 |
| --Decade 5 | | 316.0 | 505.7 | 517.8 | 517.8 | 450.8 | 455.4 | 402.7 |
| Long Run Sustained Yield (MMCF) | | 439.8 | 505.7 | 517.8 | 517.8 | 450.8 | 455.4 | 402.7 |
| Acres With Programmed Harvesting Prescriptions (M Acres): | | 1115.3 | 1125.4 | 1150.0 | 1150.0 | 972.1 | 1079.8 | 869.2 |
| Recreation Use (MRVD/Year): | | | | | | | | |
| --Developed | 143.5 | 1449.2 | 1449.2 | 494.8 | 494.8 | 494.8 | 494.8 | 1456.6 |
| --Dispersed | 1037.8 | 1537.7 | 1537.7 | 1067.6 | 1067.8 | 1067.6 | 1067.8 | 1596.9 |
| Wildlife Population Levels: | | | | | | | | |
| --Three-Toed Woodpecker (Pairs) | | 110 | 110 | 110 | 110 | 600 | 110 | 110 |
| --Deer (No. of Deer) | | N/A | N/A | N/A | N/A | 33,500 | N/A | 30,500 |
| --Osprey (Pair) | | N/A | N/A | N/A | N/A | 180 | N/A | N/A |
| --Pine Marten (No. of P.M.) | | 100 | 100 | 100 | 100 | 1890 | 100 | 100 |
| --Woodpeckers (% of Bio. Pot.) | | 20% | 20% | 20% | 20% | 80% | 20% | 20% |
| --Spotted Owls (Pairs) | | 10 | 10 | 10 | 10 | 12 | 10 | 10 |
| --Bald Eagles (Pairs) | | 45 | 45 | 45 | 45 | 50 | 45 | 45 |
| --Goshawks (Pairs) | | 70 | 70 | 70 | 70 | 115 | 70 | 70 |
| Old Growth (% of Ecoclass) | | 0 | 0 | 0 | 0 | 20% | 0 | 0 |
| Visual Quality: | | | | | | | | |
| --Percent of Max. Potential Retention, Partial Retention | | 0 | 0 | 0 | 0 | 4 | 61% | 35% |
| Range (Permitted M AUM's/Year) | | 29 | 29 | 29 | 45 | 16 | 24 | 24 |

# VII. FORMULATION OF ALTERNATIVES

## A. Introduction

### 1. Requirements Concerning the Development of Alternatives

A Forest Plan alternative is a mix of management prescriptions applied in specific locations and amounts of the Forest in order to achieve the desired management goals and objectives. Alternatives were developed according to the following NFMA 36 CFR 219.12(f) requirements:

The Interdisciplinary Team shall formulate a broad range of reasonable alternatives according to NEPA procedures. The primary goal in formulating alternatives, besides complying with NEPA procedures, is to provide an adequate basis for identifying the alternative that comes nearest to maximizing net public benefits, consistent with the resource integration and management requirements of CFR 219.13 through 219.27.

(1) Alternatives shall be distributed between the minimum resource potential and the maximum resource potential to reflect to the extent practicable the full range of major commodity and environmental resource uses and values that could be produced from the forest. Alternatives shall represent a range of resource outputs and expenditure levels.

(2) Alternatives shall be formulated to facilitate analysis of opportunity costs and of resource use and environmental tradeoffs among alternatives and between benchmarks and alternatives.

(3) Alternatives shall be formulated to facilitate evaluation of the effects on present net value, benefits, and costs of achieving various outputs and values that are not assigned monetary values, but are provided at specified levels.

(4) Alternatives shall provide different ways to address and respond to the major public issues, management concerns, and resource opportunities identified during the planning process.

(5) Reasonable alternatives which may require a change in existing law or policy to implement shall be formulated if necessary to address a major public issue, management concern, or resource opportunity identified during the planning process.

(6) At least one alternative shall be developed which responds to and incorporates the RPA Program tentative resource objectives for each forest displayed in the regional guide.

(7) At least one alternative shall reflect the current level of goods and services provided by the unit and the most likely amount of goods and services expected to be provided in the future if current management direction continues. Pursuant to NEPA procedures, this alternative shall be deemed the "no action" alternative.

(8) Each alternative shall represent to the extent practicable the most cost efficient combination of management prescriptions examined that can meet the objectives established in the alternative.

(9) Each alternative shall state at least-

(i) The condition and uses that will result from the long-term application of the alternative;

(ii) The goods and services to be produced, the timing and flow of these resource outputs together with associated costs and benefits;

(iii) Resource management standards and guidelines;

(iv) The purpose of the management direction proposed.

In addition to the RPA and Current Direction Alternatives required by the above mentioned regulations, three other alternatives were required by Regional direction: one that emphasizes high market opportunities, one that emphasizes high nonmarket opportunities, and one that emphasizes undeveloped lands with intensified management on the remainder of the Forest.

## 2. Summary of the Process Used for Developing Alternatives

The formulation of alternatives (planning step five), was based upon information gathered during the first four steps of the planning process:

-- Identification of issues, concerns, and opportunities (ICO's).

-- Development of planning criteria.

-- Resource inventories and data collection.

-- Analysis of the Management Situation.

Information gathered during these steps was assimulated and analyzed to guide the formulation of alternatives. The alternatives reflect a range of future resource management options for the Forest. Each major issue, concern, and opportunity was addressed in one or more of the alternatives. The need to satisfy legal and regulatory mandates was also a factor in the development of the alternatives. Finally, cost efficiency was a consideration throughout the process. The following discussion is a summary of the planning actions involved in the formulaton and analysis of the alternatives. The focus will be upon the roles which the ICO's and the benchmarks played in their development.

The mixture of alternatives formulated and analyzed were basically designed to address the different ways in which people prefer to use the Forest. Most of these preferences, along with the physical, biological, and legal limits of Forest management are reflected in the issues, concerns, and opportunities which were identified at the outset, and served to guide the overall Forest planning process.

A public issue was defined as being a subject or question of widespread public interest relating to management of the National Forest System.

A management concern was seen as being an issue, problem, or condition which constrained the range of management practices identified by the Forest Service during the planning process.

A third component which influenced the development of alternatives came from the various resource use and development opportunities suggested by both the public and the Forest Service.

An extensive and continuing process was used to identify and assemble the ICO's. Public meetings, newsletters, local news media, and many personal contacts by Forest Service officials were used to gather the issues. Those contacted included a wide cross section of individual members of the public, adjacent private landowners, adjacent National Forests, State and local government agencies, local industry, conservation groups, and Native Americans.

While the attempt to resolve some issues conflicts with resolving others, this is not necesarily always the case. For example, the mountain pine beetle epidemic in lodgepole pine can be addressed in a manner that complements the firewood issue if some proportion of the dead material is made available for personal use firewood. Harvesting mature lodgepole pine can also be used to improve and perpetuate bald eagle nesting habitat where the lodgepole is competing with ponderosa pine. Lodgepole stands do not provide the type of trees suitable for eagle nesting sites while ponderosa pine stands do. Finally, harvesting lodgepole pine has the potential to increase the production of forage which can be used by livestock, deer, and elk.

Recreation and visual quality are the fabric of local life styles and economies, and thus the focus of many issues. A Forest with a broad recreation base in a pleasing environment could be an asset to the central Oregon area while still providing goods and services necessary for stable timber-based industries. One mix may favor financial returns while a different mix may favor non-priced values.

The future of the remaining unroaded nonwilderness areas is also an issue. Developing some roadless areas could increase wood production or increase the opportunities for geothermal production. On the other hand, retaining some roadless areas in an undeveloped condition minimizes conflicts with habitat for threatened or sensitive wildlife species and also provides opportunities to participate in undeveloped nonwilderness types of recreation experiences.

More detail on the specifics of the planning ICO's, their inter-relationships, and their roles in the planning process can be found in Appendix A.

Once the issues, concerns, and opportunities were identified, and the planning criteria were developed, the Interdisciplinary Team began to formulate management areas and their associated standards and guidelines. Management areas coupled with their respective standards and guidelines provide specific direction for implementation, and serve as a framework for how to use, develop, and protect the Forest's resources in a manner consistent with the goals and objectives of an alternative.

Since the standards and guidelines provide general, rather than site or project specific direction on how to implement the Forest Plan, there was little opportunity to calculate a present net value or benefit/cost ratio for many of them. However, economic efficiency was a strong consideration throughout their development. For example, from a silvicultural standpoint, clearcutting and planting is more desirable in terms of control over species mix than is natural regeneration. However, natural regeneration is often more cost effective and we have had documented success with it in various plant communities. The standards and guidelines state that natural regeneration will be taken advantage of unless artificial regeneration is necessary.

Another example concerns the determination of which trees are to be left after a regeneration harvest in order to meet the cavity nester habitat needs for snags. Several alternatives were considered including artificial killing. Many options were eliminated either because they did not have documented success, were not pragmatically implementable, or were not cost effective. The resulting snag management plan specifies the number and size of trees that are to be left as future snags in such a way as to have minimum impact on the timber volumes forgone from harvest.

Finally, evidence of the concern for cost efficiency can also be found in the stated goals for the management areas. For example, the goal for Timber Management in the Plan is worded:

> "To provide for the optimum production of wood consistent with various resource objectives, environmental constraints, and economic efficiency."

This type of consideration for cost effectiveness was carried throughout the development of the management area standards and guidelines.

Concurrent with the formulation of management areas and the standards and guidelines, the Interdisciplinary Team also began to identify the analysis areas that would be used in the FORPLAN model (See Sect. III.C). For this task, a comprehensive multiresource computer mapping data base system was developed to store, retrieve, and analyze information needed to address the identified planning ICO's. It was used extensively to examine different analysis area combinations that could be used to model and evaluate the production and economic tradeoffs between the recreation, timber, visual, and wildlife resources on the Forest. The objective of this exercise was to delineate the analysis areas in such a way as to capture the important variations in the biological, social, and economic characteristics of the land and yet keep the FORPLAN model size to a minimum so it was quicker and less expensive to run.

Once the final analysis area delineation was settled upon, the next step was to develop the prescriptions for the FORPLAN model. This included the development of timber yield tables (See Sect. III.E), other resource yield coefficients, and the economic costs and benefits (See Sect. IV) associated with each FORPLAN prescription. These prescriptions were designed to enable FORPLAN to analyze the timber related outputs and economic consequences associated with alternative land allocations and multiple use objectives.

In order to provide FORPLAN with the harvest scheduling flexibility it needed to satisfy the multiple use objectives of each alternative, a wide range of timber yield tables was developed for each management area and working group combination. As the yield tables were developed, they were reviewed by the respective resource specialists to determine if they achieved their intended objectives (i.e., thermal cover, retention foreground, etc.). A soil expectation value was calculated for each. In some cases prescriptions were dropped if another prescription achieved the intended objectives equally as well but had a higher present net value. But for the most part, if FORPLAN had the room and the prescriptions contributed to the range of scheduling choices, they were included in the model so it had the option of whether to use them or not to satisfy its objective function and constraints.

The Analysis of the Management Situation was a key step leading up to the development and evaluation of alternatives. Projected demands or consumption levels were estimated for those resources which were elements of the identified planning issues, concerns, and opportunities. In turn, the potential of the Forest to supply these key resources was also analyzed.

FORPLAN played a key role in this step. Various assumptions, constraints, and objectives were combined to formulate the benchmark analyses of maximum supply potentials for each resource. A benchmark was also developed to estimate the maximum present net value of the market plus nonmarket priced resources on the Forest. This analysis established the benchmark levels required by National planning direction. The benchmarks served as reference points from which the outputs and effects of various objective functions and constraints used during the development of alternatives could be evaluated.

Once the Benchmark analyses were completed, the Interdisciplinary Team proceeded to formulate alternatives. The resource supply potentials and projected demands were compared with respect to resolving the identified planning ICO's. In turn, these potentials, when compared to the Current Direction, indicated opportunities and/or needs for change in order to best resolve the ICO's.

Alternative goals were established in order to provide a broad range of options regarding the future management of the Forest. Descriptions were written to define the resource management intent for each alternative. Each issue, concern and opportunity was addressed in one or more of the alternatives either through land allocations, harvest scheduling, standards and guidelines, or policy statements.

Finally, each alternative was analyzed using the FORPLAN model. Alternatives were modeled through the specification of an objective function and a set of constraints that were necessary to achieve the intent of a particular alternative. Prescription assignments, combined with the necessary constraints, were analyzed in FORPLAN to identify an optimal solution which maximized PNV and achieved specific resource objectives in the most economically efficient manner. With varying objectives, each alternative produced a different combination of priced and nonpriced outputs.

### 3. The Iterative Analysis Process and Cost Efficiency

FORPLAN was used to analyze the production and economic tradeoffs between the recreation, timber, visual, and wildlife resources on the Forest. The model was utilized to analyze the most economically efficient timber related outputs and effects associated with the achievement of the multiple use objectives of an alternative. Which prescriptions FORPLAN selected depended upon the objective function and the set of constraints used to represent a particular benchmark or land management plan alternative. The objective function was usually to maximize present net value or maximize the production of timber. These were subject to first satisfying all the specified constraints. The constraints were designed to guarantee the spatial and temporal feasibility of land allocation and harvest scheduling choices in order to achieve the multiple use objectives of the alternative being analyzed. The following is a list of some of the types of constraints used:

a) Constraints on harvest flow, rotation length, and ending inventory;

b) Dispersion and wildlife MMR constraints;

c) Constraints on the amount of analysis areas available to certain management area prescription sets;

d) Rate of harvest constraints in scenic view and intensive recreation allocations;

e) Constraints for thermal cover in deer winter range allocations; and

f) Other miscellaneous constraints such as accelerated lodgepole pine harvesting, species mix, and budget levels.

Once the model had determined that a feasible solution existed by satisfying all of the constraints, it would then search for the set of prescriptions and timing choices which permitted it to optimize the solution according to the specified objective function.

Several other steps in the analysis process were implemented before the evaluation of an alternative was considered complete. The outputs and effects associated with the recreation and range programs for the respective alternative were analyzed outside of FORPLAN with the use of electronic spreadsheets. During this step, alternative capital investment, and operations and maintenance strategies were examined in order to determine which combination of prescriptions were most efficient in terms of satisfying the objectives of a particular alternative.

Another step in the analysis process consisted of loading the FORPLAN solution onto the transportation network model (Transship) in order to determine the most cost efficient capital investment, and operations and maintenance program, and the associated transportation network needed to move the projected timber and recreation traffic around the Forest.

Next, an electronic spreadsheet was used to determine the total forest budget that would be required to implement each alternative. The budget estimates were based on the various resource output levels, capital investment, and operation and maintenance programs that were developed in the previous analysis steps. The budget levels were tracked by resource, appropriated versus allocated funds, and capital investment versus operations and maintenance costs.

Finally, all market plus assigned priced benefits associated with the timber, recreation, range, and special use outputs, and the associated forest budget for the first five decades were entered into a spreadsheet which calculated the overall present net value of the particular benchmark or alternative being evaluated.

Which land allocation and resource management investment options resulted in the most economically efficient solution was determined through iterative model and spreadsheet analyses. For example, the Maximum Present Net Value (PNV) Benchmark (market plus assigned values) was arrived at by first examining the solution to the Maximum PNV Benchmark (market values only) and adding the associated recreation and range present net values to it. A per acre PNV analysis indicated that the total Forest PNV could be increased by allocating intensive recreation management areas in the FORPLAN model. These allocations resulted in higher combined timber and recreation discounted values than if they had been managed for timber alone. The other recreation allocations excluded timber harvesting, and their discounted values were less than if they had been allocated to timber production. FORPLAN was run again with the appropriate intensive recreation allocations added in and the resulting timber PNV was added to the PNV for the recreation and range resources to arrive at the maximum present net value (market plus assigned) for the Forest.

The economic analysis of each alternative with FORPLAN, Transship, and the various spreadsheets was followed up by several other analytical steps before the evaluation of an alternative was considered complete. Three of these additional analytical tools were software programs developed by the Interdisciplinary Team to generate custom reports from the FORPLAN solution. One converted the cubic foot harvest schedule from FORPLAN to board feet by working group and diameter class for five decades. This was used to facilitate communications both internally and externally with people who understand boards better than cubes. Another program interpreted the dynamics of the FORPLAN forest inventory in terms of the seven successional stages by working group for fifteen decades. This better enabled the wildlife biologists to evaluate the effects of the harvest schedule solution on the habitat requirements of certain key indicator species. A third program disaggregated the FORPLAN solution to each of 86 implementation units. Implementation units are contiguous areas of land averaging 19,000 acres in size and are combinations of up to three TRI database compartments. This made it much easier for personnel on the districts to understand the implications of each alternative in terms of where, when, and how they were to implement the alternative if it were selected as the preferred. This also provided a forum for verifying the spatial feasibility of an alternative.

Sometimes the results from any one of these additional analyses indicated the need to do more FORPLAN runs in order to improve upon the overall evaluation of the outputs and effects of a particular alternative. Sometimes the need was apparent to develop another alternative and proceed through the analysis process with it. Once the Team was satisfied with the outputs and effects of the alternatives, their implications with regards to income and jobs in the local economy were analyzed with the IMPLAN input/output model. After all of this was done to satisfaction, the Interdisciplinary Team along with the Forest Management Team and district personnel then evaluated how well each alternative addressed the issues, concerns, and opportunities that were identified at the outset of the planning process. Based on this analysis, a preferred alternative was recommended to the Regional Forester.

## B. Common Constraints

The FORPLAN model was used to estimate the timber related management activities, economic consequences, and outputs by reflecting the multiple use resource management objectives of each alternative through a given set of constraints. Many of the constraints used to help formulate and characterize the different alternatives were the same across all alternatives. These were necessary in order to meet either minimum management requirements, existing laws and policies, or the objectives of prescriptions. There were also constraints which, while serving common purposes across all of the alternatives, varied in the amounts and locations to which they were applied. In addition, there were constraints which were totally unique to a particular alternative. In the following discussion, those constraints which were applied in common to all alternatives will be presented in terms of their purpose and rationale. The constraints which were more or less unique between the alternatives will be discussed in the next section pertaining to the development of alternatives.

While many of the constraints discussed in this section were common to all of the alternatives, the amount of acres they applied to varied depending on the different objectives and resulting allocations of resources associated with each alternative. The tradeoffs discussed pertaining to each set of constraints are presented in general terms rather than specific quantified measures. This is because each constraint set was not isolated and analyzed with regards to the development of each alternative. Most of them were examined during the benchmark analyses performed for the Analysis of the Management Situation. The relative magnitude of tradeoffs associated with these constraint groups can be obtained by referring to the benchmark analysis results in Chapter VI of this Appendix, and the allocation of land to various management area prescriptions presented in the next section pertaining to the development of alternatives.

### 1. The Ending Inventory Constraint

a. Purpose:

The use of this constraint ensures that the total inventory volume left at the conclusion of the harvest scheduling planning horizon (150 years) will equal or exceed the volume that would occur in a regulated forest managed in accordance with the prescriptions selected for regenerated timber.

b. Rationale:

If this constraint were not used, the FORPLAN model would have no incentive to leave enough inventory at the end of the harvest scheduling horizon to sustain the harvest levels into perpetuity.

c. Tradeoff:

Since some volume which is available for harvest at the end of the harvest scheduling horizon must be reserved for future decades, timber related outputs and benefits will be reduced.

### 2. The 40-Acre Unit Size/Logical Leave Unit Dispersion Constraints

a. Purpose:

This constraint is used so that the resulting FORPLAN harvest scheduling solution is in compliance with the Regulations 36 CFR 219.27(d)(2) which states that evenaged regeneration harvest units do not exceed 40 acres in size and that these openings are separated by logical harvest units.

b. Rationale:

If these constraints were not used, the FORPLAN model could schedule for harvest in one decade large contiguous acreages of stands in order to best meet its objective function of maximizing present net value. To prohibit this from happening, upper limit constraints are placed on the proportion of an area that can be in harvest created openings at one time. The area is specified by combinations of the ranger district, working group, and maturity class analysis area identifiers.

c. Tradeoff:

Since the unit size/dispersion constraints have the potential to restrict FORPLAN's freedom in the way it schedules the harvesting of timber to meet its objectives, both the present net value (PNV) and the allowable sale quantity (ASQ) may be reduced as a result of these constraints. However, the analysis performed on these MMR constraints during the AMS indicated that the impacts would not alter the final solution by more than 1 or 2 percent.

3. Inventory Constraints for Wildlife MMR's

a. Purpose:

These constraints are applied to ensure that the wildlife habitat minimum management requirements for three-toed-woodpeckers, goshawks, and pine martens are satisfied in accordance with the regulations.

b. Rationale:

All of these species are dependent upon mature and overmature stands of trees for their habitat. These constraints were designed to maintain at least the MMR levels of habitat for these species. If they were not applied, it is very likely that FORPLAN would convert all or most of the mature and overmature suitable habitat to young managed plantations by the 5th or 6th decade.

c. Tradeoff:

Since certain specified amounts of mature and overmature stands which are available for regeneration harvest must be reserved until replacement stands are available, FORPLAN's harvest scheduling flexibility is restricted and may result in a lower PNV or ASQ. The analysis performed on these constraints during the AMS indicated that they would impact the final solution by less than half a percent.

4. Rate of Harvest Constraints in Bald Eagle and Spotted Owl Areas

a. Purpose:

These constraints are applied to ensure that the wildlife habitat minimum management requirements for bald eagles and northern spotted owls are satisfied in accordance with the regulations. These constraints were designed to achieve and maintain multi-storied ponderosa and mixed conifer stands with 8 to 10 old growth trees which would provide suitable nesting habitat for bald eagles and northern spotted owls. These constraints were used in conjunction with unevenaged or small group selection evenaged prescriptions designed to grow 350 year old trees with multiple understories. The constraints placed an upper limit proportion of 3.8 percent on the amount of area that can be harvested in each decade. This ensured that the larger nesting area as a whole would provide suitable habitat in the long run.

b. Rationale:

If these constraints were not applied to the bald eagle and spotted owl nesting areas, FORPLAN would have converted the existing mature and overmature stands to young managed plantations without any consideration of the habitat needs of these species.

c. Tradeoffs:

Since these constraints restrict FORPLAN's harvest scheduling flexibility, they do tend to lower the present net value and allowable sale quantity levels of an alternative. How much they do so is a function of the amount of acres allocated to bald eagle and spotted owl nesting habitat in each particular alternative. Of course, the tradeoffs associated with achieving the habitat needs for these species result from the combined effects of both the special extended rotation prescriptions and the upper limit constraints on the rate of harvesting.

5. Constraints on the Amount of Harvest Created Openings in Scenic Views Management Areas

a. Purpose:

These discretionary constraints are used in conjunction with special FORPLAN prescriptions in order to ensure that visual management objectives are achieved on portions of the Forest allocated to the Scenic Views Management Area. They are designed to provide an upper limit proportion on the amount of a seen area that can be in harvest created openings at one time. The upper limit bounds are a function of the working group and visual sensitivity of the area. In general, the upper limit proportions range from 8 percent for retention foreground ponderosa pine stands to 24 percent for partial retention lodgepole stands. The upper limit proportion of an area that can be in harvest created openings in all middleground scenic views is 13 percent.

b. Rationale:

In the absence of these constraints, the model would have scheduled too much harvesting, too fast, and in too large of units to achieve the conditions that would satisfy the visual management objectives in parts of the Forest allocated to the Scenic Views Management Area.

c. Tradeoff:

Since these constraints restrict FORPLAN's harvest scheduling flexibility, they do tend to lower the present net value and allowable sale quantity levels of an alternative. How much they do so is a function of the amount of acres allocated to the Scenic Views Management Area in a particular alternative. However, in the benchmark which was developed to explore the tradeoffs associated with managing the Forest to achieve its maximum visual benefits, the allowable sale quantity dropped 11 percent from Benchmark Run-7. Of course, this was a result of the combined effects of both the special extended rotation prescriptions and the constraints on harvest created openings.

6. Constraints on the Amount of Harvest Created Openings in Intensive Recreation Management Areas

a. Purpose:

These discretionary constraints are used in conjunction with special FORPLAN prescriptions in order to ensure that visual management objectives are achieved on portions of the Forest allocated to the Intensive Recreation Management Area. They are designed to provide an upper limit proportion on the amount of a seen area that can be in harvest created openings at one time. In general, the objective in and around intensive recreation areas is to attain and maintain retention foreground visual standards. The upper limit bounds are a function of the working group and range from 8 percent in ponderosa pine to 18 percent in lodgepole.

b. Rationale:

In the absence of these constraints, the model would have scheduled too much harvesting, too fast, and in too large of units to achieve the conditions that would satisfy the visual management objectives for intensive recreation areas.

c. Tradeoff:

Since these constraints restrict FORPLAN's harvest scheduling flexibility, they do tend to lower the present net value and allowable sale quantity levels of an alternative. How much they do so is a function of the amount of acres allocated to the Intensive Recreation Management Area in a particular alternative. Of course, the tradeoffs associated with achieving the visual quality objectives in the intensive recreation areas results from the combined effects of both the special extended rotation prescriptions and the upper limit constraints on harvest created openings.

7. Deer Winter Range Forage to Cover Ratio Constraints

a. Purpose:

These scheduled output constraints were utilized to achieve and maintain the desired 60:40 ratio of foraging area to thermal cover areas on forested lands allocated to the Deer Habitat Management Area. Stands aged 0 to 40 were open enough to be considered as forage areas while stands over forty years of age had sufficient crown cover to meet thermal cover needs.

b. Rationale:

Current forage to cover conditions on inventoried deer winter ranges are less than optimal. There is an excess of cover and not enough foraging area according to the wildlife habitat guides. An imbalance between forage and cover would continue to occur if these forage to cover ratio constraints were not applied to the appropriate areas. There would always be a tendency to have too much cover. Therefore, upper limit proportion constraints of 30 percent cover (ie. resulting in a maximum possible ratio of 70 percent forage to 30 percent cover) were applied to all ponderosa forested deer winter range allocations on the Forest. These constraints were often difficult, if not impossible, to meet if final harvest decisions were delayed until CMAI had been reached. Therefore, in addition to the upper limit constraints on cover, rotations short of CMAI were also permitted in order to meet the deer habitat management objectives for these areas.

### c. Tradeoffs:

The application of these constraints had opposing effects on economic versus timber outputs. In order to approach and continue to maintain the desired forage to cover ratio, the model had to harvest stands short of CMAI but closer to their economic maxima. On the other hand, by harvesting stands short of CMAI, they were not providing their maximum possible contribution to the LRSY, which on a surplus old growth forest under NDF is directly binding on the ASQ. Therefore, while wood outputs resulting from these constraints may be somewhat lower, their reductions are offset by harvesting stands closer to their age of maximum economic return.

## C. Development of Alternatives

The following discussion pertains to the development of the eight alternatives displayed in the DEIS. The focus will be upon describing the purpose of each alternative and identifying the constraints used to characterize them so their multiple resource management objectives were achieved as efficiently as possible.

Each alternative is a combination of land uses, forest management activities, and resource outputs. As such, alternatives must consider the resource production capabilities (both the high and low limitations) of the many different areas on the Forest. Each alternative is designed to manage the land to achieve some predetermined goals and objectives. Some of these objectives, such as maintaining clean air and water, are common to all of the alternatives; while other objectives, such as providing a certain mix and amount of resources outputs, vary between the alternatives. Several steps were involved in the development and analysis of the alternatives. They can be summarized as follows:

1. National and Regional direction, the planning ICO's, and the benchmark analyses were all used to help define a broad range of reasonable management alternatives which needed to be developed.

2. Within that range, alternatives with different management philosophies, goals and objectives were developed so as to reflect a wide range of choices concerning the best way to manage the Forest in order to maximize net public benefits.

3. Once the management philosophies, goals and objectives for all of the alternatives were determined, a land use pattern for the Forest was developed to reflect the intent of each alternative.

4. Other resource management objectives for each alternative were formulated in terms of constraints on activities, resource mixes and output levels, etc. in order to fully characterize the purpose of the alternative.

5. FORPLAN was then used to analyze the timber related outputs and effects for each alternative under nondeclining flow, CMAI, and the various allocation and multiple resource constraints developed in the preceding steps.

6. The results from the original FORPLAN run were examined with regards to how well the predetermined goals and objectives of the alternative were achieved. It was during this stage of the alternative development process in which constraints for resource mixes and output levels, rotations short of CMAI, and departures from nondeclining flow were examined. Usually, two to five more FORPLAN runs were executed before this stage of the alternative development and analysis process was considered complete.

7. The Transship Network Model, and various customized software packages and electronic spreadsheets were then used to evaluate other outputs and effects associated with each alternative. Based on the results of this analysis, additional FORPLAN runs may or may not have been necessary to finish the alternative.

In the following discussion, the purpose of each alternative, the criteria and assumptions underlying its development, and its accompanying constraints are presented. The constraints presented are those which were used in the final FORPLAN formulation of the alternative as it appears in the DEIS.

The tradeoffs associated with the individual constraint sets within each alternative are also discussed per the requirements of the May 17th outline for Appendix B, Chapter 7 Section C, and Chapter 8 Section D. The requirements of these two sections seemed to duplicate each other, so they were combined into this one section.

It is important to note that a with and without constraint by constraint analysis was not performed during the development of each alternative. The costs of this type of analysis is prohibitive. As discussed in the outline above, the development of each alternative was based upon a sequence of from 3 to 7 FORPLAN runs. From one run to the next, constraints were added or modified in order to accomplish the stated objectives of the alternative. Sometimes one constraint or constraint set was added, while at other times multiple constraints or sets of constraints were added. However, by examining the incremental changes in the FORPLAN solution from one run to the next, some idea of the marginal tradeoffs in terms of timber related PNV, discounted benefits, discounted costs, the ASQ, and the LRSY can be obtained.

For purposes of this analysis, the first run for each alternative will be compared to Benchmark Run-11. This benchmark was formulated with an objective function of maximize PNV subject to satisfying the following constraints:

1. Nondeclining flow with a LRSY link.

2. Ending inventory.

3. General Forest rotations based upon 95 percent CMAI.

4. General Forest MMR constraints for harvest unit size and dispersion.

5. Wildlife MMR constraints for bald eagles, spotted owls, goshawks, pine martens, and three-toed-woodpeckers.

6. Volume reductions in the timber yield tables to account for enough snag replacement trees left after harvest to maintain the habitat for 20 percent (the MMR level) of the cavity nester population potential.

To this run, constraints were added in order to achieve the unique multiple resource management objectives of each alternative. It is the results produced from the addition of these constraints which will be discussed below.

One final comment needs to be made before beginning. Over 200 FORPLAN runs were executed in order to perform the necessary analysis of benchmarks and alternatives for this DEIS. Only the ones which shed some light on the tradeoffs associated with the constraints used in developing the final alternatives will be discussed here. Many runs were made while leading up to the final formulation of an alternative which were primarily for information purposes, and will not be discussed here. For more information regarding the process of developing the alternatives, refer to the planning records available at the Deschutes National Forest Supervisor's Office, East Highway 20, Bend, Oregon 97701.

1. Alternative A (Current Direction)

   The purpose of the "No Action" Alternative, as required by NEPA, is to portray a description of the outputs and effects that could be expected to occur if the current management direction, as provided by the 1978 Land Management Plan, is continued. It was not to specifically designed to address the identified planning ICO's. It features a blend of land uses intended to balance resource uses. Dispersed recreation, visual quality, and deer habitat management are emphasized along with timber and range management. Some emphasis is also placed on developed recreation, old growth, and threatened and endangered species.

a. The criteria and assumptions underlying the development of this Alternative are:

   (1) It will be based on existing land use patterns and management direction provided in the 1978 Land Management Plan, and other functional/unit plans pertaining to the way the Forest is currently being managed.

   (2) Mature and over mature lodgepole pine will be converted to managed stands over the next 30 years according to the Swatter EA. No exiting mature and overmature lodgepole will be utilizable after the conclusion of the third decade.

   (3) The first decade wood outputs of this Alternative will be constrained to reflect the timber sale program as portrayed in the current five year action plan.

   (4) Rotation ages will be based on 95 percent of CMAI except that ponderosa pine stands in deer winter range can be harvested at ages sooner than 95 percent CMAI in order to achieve thermal/cover objectives.

   (5) Enough live snag replacement trees will be left after harvest to provide habitat for 60 percent of the cavity nester population potential.

b. In addition to the commmon constraints described in Section B above, other unique constraints were also used in order to help achieve the objectives of this Alternative. These additional constraints were incorporated into the development of the Alternative in one or more sequential FORPLAN runs for which the results are summarized in Table B-VII-1. The purpose, rationale, and tradeoffs associated with each of these unique individual constraints, or constraint sets, is discussed below.

## TABLE B-VII-1

## ANALYSIS OF CONSTRAINTS WITHIN ALTERNATIVE A

| FORPLAN RUN | PNV ($MM) | DISCOUNTED BENEFITS ($MM) | DISCOUNTED COSTS ($MM) | ASQ (MMCF/YR) | LRSY (MMCF/YR) |
|---|---|---|---|---|---|
| Benchmark 11 | 1077.2 | 1227.4 | 150.2 | 50.6 | 50.6 |
| Alt-A (Run-1) with added constraints:<br>--multiple res. obj. & allocations<br>--10 year timber sale action plan<br>--LPP Swatter EA | 750.2 | 897.3 | 147.1 | 39.6 | 40.7 |

(1) Land Allocation Constraints

(a) Purpose:

These constraints were applied so that the multiple resource land use pattern of the current land management plan would be correctly represented across all of the FORPLAN analysis areas.

(b) Rationale:

Since many of the wildlife, recreation, and visual resources on the Forest are not represented with output and value coefficients in FORPLAN, in the absence of these constraints the Model would only have timber related values available to it for making land allocation choices. These constraints indicate how many acres of each analysis area should be allocated to particular multiple resource management emphases. FORPLAN then decides which schedule of management activities, and which level of capital investment is the most efficient in order to meet the overall objectives of the Alternative. These constraints also determine the number of acres to which the various common multiple use constraints discussed in the previous section are applied to. The breakdown of acres allocated to the various FORPLAN management emphases for this Alternative are displayed in Table B-VII-2:

## TABLE B-VII-2
## FORPLAN MANAGEMENT EMPHASES ALLOCATIONS FOR ALTERNATIVE A

| MANAGEMENT EMPHASES | ACRES |
|---|---|
| General Forest | 657,067 |
| Scenic Views: | |
| Middleground | 100,706 |
| Retention Foreground | 74,244 |
| Partial Retention Foreground | 115,696 |
| Deer Habitat | 68,082 |
| Threatened & Endangered Bird Species | 2,966 |
| Oregon Cascade Recreation Area | 42,650 |
| Wilderness | 182,394 |
| Other Management Areas (No Programed Cut) | 379,843 |
| TOTAL FOREST | 1,623,648 |

(c) Tradeoffs:

While these constraints were not evaluated seperately from the other constraints for this alternative, the analyses performed for some of the other alternatives would suggest that they accounted for 70 to 80 percent of the drop in PNV from 1077.2 $MM in BM-11 to 750.2 $MM. Most of this was accounted for by a reduction in the timber related discounted benefits since discounted costs did not vary much. In the absence of these constraints, both the timber related present net value and outputs would be higher, while the other multiple resource outputs and associated values would be lower. However, without these constraints, the multiple use resource management objectives of this Alternative would not be satisfied.

(2) Nondeclining Flow/Long Run Sustained Yield Constraints

(a) Purpose:

Presumeably, the Forest is currently selling and harvesting timber on a nondeclining flow basis. This set of constraints is designed to assure that future harvest levels will never decline and that the harvest levels will be less than or equal to the long run sustained yield at the end of the harvest scheduling planning horizon.

(b) Rationale:

Without these constraints, harvest levels could rise and fall erradically. This would not be consistent with the current management plan.

(c) Tradeoffs:

BM-11 also imposes a nondeclining flow constraint set, so there are no tradeoffs between that benchmark and this Alternative, due to this constraint. However, by imposing the nondeclining flow constraints as opposed to permitting a departure harvest schedule, the model's flexibility to harvest timber in such a way as to maximize PNV is reduced. Therefore, early decade economic returns and timber output levels are traded off in exchange for stable long term harvest levels.

(3) Five Year Action Plan Constraints

(a) Purpose:

These constraints forced the model to harvest in the first decade the same amount of timber by working group, management area, and ranger district as the Forest currently programs under the 5-year action plan (doubled to make it a 10 year plan).

(b) Rationale:

It was assumed that the first decade of the "No Action" Alternative should be modeled as a continuation of the current 5 year timber sale action plan which the Forest is operating under. If these constraints were not applied, the model would schedule a different mix of working groups by management area, and by ranger district in order to satisfy its' objective function of maximize PNV.

(c) Tradeoffs:

Due to these constraints, the first decade harvest was a lower volume than it could have been (39.6 MMCF/yr vs 40.7 MMCF/yr) and, thus, so was the PNV.

(4) Lodgepole Pine 20-30 Year Conversion Constraints

(a) Purpose:

These constraints were used to force the model to convert the mature and over-mature lodgepole pine stands to managed stands in general forest areas over the next 20 years, and in sensitive visual and recreation areas over the next 30 years as called for in the approved mountain pine beetle Swatter EA.

(b) Rationale:

Without these constraints the model would not convert these stands until the third thru the fifth decades. This is not in accordance with the Swatter EA which the Forest is currently operating under, and, by this time, the mountain pine beetle would have killed 85 percent or more of the trees.

(c) Tradeoffs:

Since these constraints force the model to cut the lower valued lodgepole sooner than it normally would and usually result in at least some substitution of this lower valued species for the higher valued ponderosa pine, they lead to a decline in the present net value of the timber resource. Based on analyses performed during the development of the other alternatives, these constraints probably account for 20 to 30 percent of the difference in PNV between BM-11 and this Alternative.

2. Alternative B (RPA Alternative)

The purpose of this Alternative is to meet the RPA Program and provide opportunities for undeveloped recreation, winter recreation, old growth, and visual quality. It is similar to Alternative F but has somewhat different implications regarding the development of the roadless areas. Visual quality is provided for on most of the major roads and buttes. Only a part of the high potential geothermal areas would be available for leasing. Mule deer populations could increase some as well as bald eagle populations. Undeveloped recreation opportunities would be available in roadless areas, the Wildernesses, and the Oregon Cascade Recreation Area.

a. The criteria and assumptions underlying the development of this Alternative are:

(1) Meeting the RPA program timber targets is the primary objective of this Alternative. If necessary, a departure from nondeclining yield will be used to accomplish this objective.

(2) A range and balance of recreation opportunities will be provided including both developed and undeveloped recreation experiences.

(3) Some special Interest Areas will be provided to enhance the recreation opportunity spectrum.

(4) Portions of two rivers will be recommended for classification as Recreation Rivers under the Wild and Senic Rivers Act.

(5) Six new Research Natural Areas will be recommended for inclusion into the system.

(6) Populations of mule deer could increase and exceed the current population objectives. Spotted owls would be maintained at there current levels. Habitat for bald eagles and cavity nesters would be increased. Habitat for pine marten and goshawks would be decreased.

(7) Mature and over mature lodgepole pine will be converted to managed stands over the next 15 to 20 years. No existing mature and overmature lodgepole will be utilizable after the conclusion of the third decade.

(8) Rotation ages will be based on 95 percent of CMAI except that ponderosa pine stands in deer winter range can be harvested at ages sooner than 95 percent CMAI in order to achieve thermal/cover objectives.

(9) Enough live snag replacement trees will be left after harvest to provide habitat for 60 percent of the cavity nester population potential.

b. In addition to the commmon constraints described in Section B above, other unique constraints were also used in order to help achieve the objectives of this Alternative. These additional constraints were incorporated into the development of the Alternative in one or more sequential FORPLAN runs for which the results are summarized in the following table. The purpose, rationale, and tradeoffs associated with each of these unique individual constraints, or constraint sets, is discussed below.

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## TABLE B-VII-3

## ANALYSIS OF CONSTRAINTS WITHIN ALTERNATIVE B

| FORPLAN RUN | PNV ($MM) | DISCOUNTED BENEFITS ($MM) | DISCOUNTED COSTS ($MM) | ASQ (MMCF/YR) | LRSY (MMCF/YR) |
|---|---|---|---|---|---|
| Benchmark 11 | 1077.2 | 1227.4 | 150.2 | 50.6 | 50.6 |
| Alt-B (Run-1) with added constraints: --multiple res. obj. & allocations | 841.0 | 980.6 | 139.6 | 40.6 | 40.6 |
| Alt-B (Run-2) with added constraints: --LPP conversion | 746.5 | 896.4 | 149.9 | 40.8 | 40.8 |
| Alt-B (Run-3) with added constraints: --RPA departure | 7569.3 | 910.6 | 151.3 | 42.0 | 40.8 |

### (1) Land Allocation Constraints

(a) Purpose:

These constraints were applied so that the multiple resource land use pattern needed to achieve the objectives of this Alternative would be correctly represented across all of the FORPLAN analysis areas.

(b) Rationale:

Since many of the wildlife, recreation, and visual resources on the Forest are not represented with output and value coefficients in FORPLAN, in the absence of these constraints the Model would only have timber related values available to it for making land allocation choices. These constraints indicate how many acres of each analysis area should be allocated to particular multiple resource management emphases. FORPLAN then decides which schedule of management activities, and which level of capital investment is the most efficient in order to meet the overall objectives of the Alternative. These constraints also determine the number of acres to which the various common multiple use constraints discussed in the previous

section are applied to. The breakdown of acres allocated to the various FORPLAN management emphases for this Alternative are displayed in the following table:

### TABLE B-VII-4
### FORPLAN MANAGEMENT EMPHASES ALLOCATIONS FOR ALTERNATIVE B

| MANAGEMENT EMPHASES | ACRES |
|---|---|
| General Forest | 700,164 |
| Scenic Views: | |
| Middleground | 83,247 |
| Retention Foreground | 64,185 |
| Partial Retention Foreground | 53,828 |
| Deer Habitat | 99,196 |
| Intensive Recreation | 31,732 |
| Threatened & Endangered Bird Species | 23,270 |
| Oregon Cascade Recreation Area | 42,650 |
| Wilderness | 182,394 |
| Other Management Areas (No Programed Cut) | 342,980 |
| TOTAL FOREST | 1,623,648 |

(c) Tradeoffs:

The timber related tradeoffs associated with these constraints are best portrayed by examining the differences between BM-11 and Run-1 in Table VII-3 above. The imposition of these constraints and the other common multiple use constraints associated with them resulted in a decrease in the timber related PNV from 1077.2 $MM in BM-11 to 841.0 $MM, a 22 percent decrease. However, without these constraints, the multiple use resource management objectives of this Alternative would not be satisfied. The drop in PNV was mostly in response to the 20 percent reduction in timber output levels (50.6 MMCF/yr down to 40.6 MMCF) and their related benefits.

(2) Lodgepole Pine 15-20 Year Conversion Constraints

(a) Purpose:

The Swatter EA was developed in 1981. It called for a 20- to 30-year conversion of mature and overmature lodgepole pine in order to recover as much utilizable wood fiber as possible before the beetles got to it, mitigate the impacts of accelerated harvesting in LPP on the other resources, and begin to convert these slow growing high risk stands to young vigorous managed stands. Entomologists are now predicting that in 15 or so years, 85 percent of the mature and overmature lodgepole stands will be dead due to beetle attacks. These constraints were used to force the model to convert the mature and overmature lodgepole pine stands to managed stands over the next 15 to 20 years.

(b) Rationale:

Without these constraints the model would not convert these stands until the third thru the fifth decades. The mature lodgepole stands are expected to be mostly dead in 15 years. The dead trees may be utilizable as firewood for another ten years after death.

(c) Tradeoffs:

The tradeoff implications of these constraints are best determined by comparing the differences between Run-1 and Run-2 for Alternative B displayed in Table B-VII-3 above. Since these constraints force the model to cut the lower valued lodgepole sooner than it normally would and usually result in at least some substitution of this lower valued species for the higher valued ponderosa pine, they lead to an additional decline in the present net value of the timber resource from 841.0 $MM for Run-1 to 746.5 $MM for Run-2. The change in PNV was not caused by a reduction in timber output levels, but was due to the lower valued species mix and higher discounted timber management costs.

(3) Departure Harvest Flow/Long Run Sustained Yield Equality/RPA Target Constraints

(a) Purpose:

One of the primary objectives of this Alternative is to exactly meet the RPA timber targets for the first five decades. It was not able to to this under nondeclining even flow. These constraints were designed to allow the harvest schedule to depart from nondeclining yield in order to exactly meet the RPA timber targets for the first 50 years, then drop down at a maximum rate of 10 percent per decade until it recovers enough volume to cut at the LRSY derived from the original base schedule run for this Alternative.

(b) Rationale:

Without these constraints, harvest levels would not be high enough to satisfy the RPA program targets.

(c) Tradeoffs:

By allowing the harvest schedule to depart from nondeclining flow, the first decade harvest levels increased from 408.3 MMCF to 420.0 MMCF, and the PNV of the timber program increased from 746.5 $MM to 759.3 $MM. This is evident by comparing Run-2 to Run-3 in Table B-VII-3.

### 3. Alternative C

The purpose of this Alternative is to address those ICO's which are related to the production of goods and services from the Deschutes National Forest. As such, this alternative satisfies the Regions' requirements for an alternative which emphasizes commodity production. High levels of wood, range, developed recreation, mule deer, and geothermal energy are provided. The timber levels meet the States Forestry Program for Oregon. Mule deer population levels could increase providing increased hunting opportunity. Most of the high potential geothermal areas could be available for leasing. All of the roadless areas could be developed.

a. The criteria and assumptions underlying the development of this Alternative are:

(1) This Alternative emphasizes the production of commodity resources from the Forest. As such, a departure from nondeclining yield is acceptable as a means to accelerate the harvest of surplus old growth inventory.

(2) Developed recreation will be emphasized. Both undeveloped and dispersed recreation will be primarily limited to the Wildernesses and the Oregon Cascade Recreation Area.

(3) Wildlife habitat, other than mule deer winter and transition ranges, will be provided at the Minimum Management Requirement levels.

(4) Visual quality will only be provided for along the major highways.

(5) No new Research Natural Areas are proposed.

(6) Mature and overmature lodgepole pine will be converted to managed stands over the next 10 to 15 years. No existing mature and overmature lodgepole will be utilizable after the conclusion of the third decade.

(7) Rotation ages will be based on 95 percent of CMAI except that ponderosa pine stands in deer winter range can be harvested at ages sooner than 95 percent CMAI in order to achieve thermal/cover objectives.

(8) Enough live snag replacement trees will be left after harvest to provide habitat for 20 percent of the cavity nester population potential.

b. In addition to the commmon constraints described in Section B above, other unique constraints were also used in order to help achieve the objectives of this Alternative. These additional constraints were incorporated into the development of the Alternative in one or more sequential FORPLAN runs for which the results are summarized in the following table. The purpose, rationale, and tradeoffs associated with each of these unique individual constraints, or constraint sets, is discussed below.

## TABLE B-VII-5

## ANALYSIS OF CONSTRAINTS WITHIN ALTERNATIVE C

| FORPLAN RUN | PNV ($MM) | DISCOUNTED BENEFITS ($MM) | DISCOUNTED COSTS ($MM) | ASQ (MMCF/YR) | LRSY (MMCF/YR) |
|---|---|---|---|---|---|
| Benchmark 11 | 1077.2 | 1227.4 | 150.2 | 50.6 | 50.6 |
| Alt-C (Run-1) with added constraints: --Multiple res. obj. & allocations | 980.0 | 1136.8 | 156.7 | 46.9 | 46.9 |
| Alt-C (Run-2) with added constraints: --No prog. cut in IR | 959.1 | 1109.4 | 150.3 | 45.7 | 45.7 |
| Alt-C (Run-3) with added constraints: --LPP conversion | 844.2 | 1000.3 | 156.1 | 45.4 | 45.4 |
| Alt-C (Run-4) with added constraints: --Departure from NDF | 899.2 | 1084.8 | 185.6 | 59.8 | 45.4 |

(1) Land Allocation Constraints

(a) Purpose:

These constraints were applied so that the multiple resource land use pattern needed to achieve the objectives of this Alternative would be correctly represented across all of the FORPLAN analysis areas.

(b) Rationale:

Since many of the wildlife, recreation, and visual resources on the Forest are not represented with output and value coefficients in FORPLAN, in the absence of these constraints the Model would only have timber related values available to it for making land allocation choices. These constraints indicate how many acres of each analysis area should be allocated to particular multiple resource management emphases. FORPLAN then decides which schedule of management activities, and which level of capital investment is the most efficient in order to meet the overall objectives of the Alternative. These constraints also determine the number of acres to which the various common multiple use constraints discussed in the previous section are applied to. The breakdown of acres allocated to the various FORPLAN management emphases for this Alternative are displayed in the following table:

TABLE B-VII-6
FORPLAN MANAGEMENT EMPHASES ALLOCATIONS FOR ALTERNATIVE C

| MANAGEMENT EMPHASES | ACRES |
|---|---|
| General Forest | 871,735 |
| Scenic Views: | |
| Middleground | 7,675 |
| Retention Foreground | 22,306 |
| Partial Retention Foreground | 11,323 |
| Deer Habitat | 117,117 |
| Intensive Recreation | 52,881 |
| Threatened & Endangered Bird Species | 19,453 |
| Oregon Cascade Recreation Area | 42,650 |
| Wilderness | 182,394 |
| Other Management Areas (No Programed Cut) | 296,120 |
| TOTAL FOREST | 1,623,648 |

(c) Tradeoffs:

The tradeoffs associated with the imposition of these constraints are portrayed by comparing the differences between BM-11 and Run-1 of Alternative C in Table VII-5. These constraints caused the timber ouputs and related discounted benefits to drop about 8 percent from those produced in BM-11. At the same time, discounted costs rose 4 percent form 150.2 $MM to 156.7 $MM. The overall result was n decrease in PNV from 1077.2 $MM in BM-11 to 980.0 $MM in Run-1. The drop in timber related PNV in this Alternative due to the application of these constraints is not as great as in the other alternatives because its land use pattern emphasizes the production of wood fiber. None-the-less, in the absence of these constraints, both the timber related present net value and outputs would be higher, while the other multiple resource outputs and associated values would be lower. However, without these constraints, the multiple use resource management objectives of this Alternative would not be satisfied.

(2) Constraints to Prohibit Programmed Timber Harvesting in Intensive Recreation Areas

(a) Purpose:

Often, the programming of timber harvesting in heavily used and visually sensitive recreation areas is a sensitive issue. Some forest managers believe that the silvicultural objectives in these areas can be achieved equally as well and with more flexibility if the harvesting in these areas is done on a non-programed basis. These constraints prohibit the model from scheduling timber harvesting in intensive recreation areas.

(b) Rationale:

If it were not for these constraints, FORPLAN would schedule timber harvesting in these areas.

(c) Tradeoffs:

The overall effects of these constraints was to remove 52,881 acres of comercial forest lands in intensive recreation allocations from the land base available for programmed timber harvesting. Consequently, under nondeclining yield flow, the imposition of these constraints on this Alternative resulted in a reduction in the allowable sale quantity and long run sustained yield of 1.2 MMCF/yr, or 2.5 percent. The PNV was reduced from 980.0 $MM to 959.1 $MM. These results were determined by comparing Run-1 to Run-2 in Table VII-5.

(3) Lodgepole Pine 10-15 Year Conversion Constraints

(a) Purpose:

The Swatter EA was developed in 1981. It called for a 20- to 30-year conversion of mature and overmature lodgepole pine in order to recover as much utilizable wood fiber as possible before the beetles got to it, mitigate the impacts of accelerated harvesting in LPP on the other resources, and begin to convert these slow growing high risk stands to young vigorous managed stands. Entomologists are now predicting that in 15 or so years, 85 percent of the mature and overmature lodgepole stands will be dead due to beetle attacks. These constraints were used to force the model to convert the mature and overmature lodgepole pine stands to managed stands over the next 10 to 15 years.

(b) Rationale:

Without these constraints the model would not convert these stands until the third thru the fifth decades. The mature lodgepole stands are expected to be mostly dead in 15 years. The dead trees may be utilizable as firewood for another ten years after death.

(c) Tradeoffs:

Since these constraints force the model to cut the lower valued lodgepole sooner than it normally would and usually result in at least some substitution of this lower valued species for the higher valued ponderosa pine, they lead to a decline in the present net value of the timber resource. This is eveident by comparing the results of Run-2 and Run-3 displayed in Table VII-5 above. While timber outputs as reflected by the ASQ and LRSY levels remained relatively constant, discounted timber benefits decreased and discounted costs increased resulting in an overall drop in the PNV from 959.1 $MM to 844.2 $MM.

(4) Departure Harvest Flow/Long Run Sustained Yield Floor Constraints

(a) Purpose:

One of the primary objectives of this Alternative is to emphasize the production of wood outputs. Departing from nondeclining yield in order to harvest surplus old growth inventory is an exceptable means of accomplishing this objective. These constraints permitted the harvest schedule to deviate from one decade to the next by a maximum of 10 percent while never dropping below the LRSY level established in the original base schedule run for this Alternative.

(b) Rationale:

Surplus old growth forests may consider departing from nondeclining yield as a means of prohibiting excessive losses due to mortality.

(c) Tradeoffs:

By allowing the harvest schedule to depart from nondeclining flow, the first decade harvest levels increased from 45.4 MMCF/yr under nondeclining flow to 59.8 MMCF, and the PNV of the timber program increased from 844.2 $MM to 899.2 $MM.

4. Alternative D

The purpose of this Alternative is to address issues associated with recration, visual quality, and timber production. This Alternative provides for consideration of visual quality along major highways, many secondary roads, prominent buttes and many of the more popular trails. Wood production is high and the potential for geothermal leasing is high. Mule deer populations could increase. Some of the roadless areas would not be developed. The Forest would be managed intensively but it would not be readily apparent to people traveling and recreating along the roads and trails. The opportunity for undeveloped recreation would be limited to small undeveloped areas, the Wildernesses, and the Oregon Cascade Recreation Area.

a. The criteria and assumptions underlying the development of this Alternative are:

(1) The timber harvest schedule will be based upon nondeclining flow while increasing outputs above the Current Direction.

(2) A high opportunity for day use recreation will be provided as well as driving for pleasure in a naturally appearing forested environment.

(3) In addition to providing habitat for deer, habitat for osprey, woodpeckers, bald eagles, spotted owls, and other species associated with mature and old growth forests will be provided to enhance the day use recreational activities.

(4) Special Interest Areas will be provided as a means of supporting day use recreational pursuits. Most of these are associated with geological features.

(5) Two new Research Natural Areas will be proposed for inclusion into the system.

(6) Portions of 3 rivers will be recommended for classification as Recreation Rivers under the Wild and Scenic Rivers Act.

(7) Mature and over mature lodgepole pine will be converted to managed stands over the next 20 years. No existing mature and overmature lodgepole will be utilizable after the conclusion of the third decade.

(8) Rotation ages will be based on 95 percent of CMAI except that ponderosa pine stands in deer winter range can be harvested at ages sooner than 95 percent CMAI in order to achieve thermal/cover objectives.

(9) Enough live snag replacement trees will be left after harvest to provide habitat for 40 percent of the cavity nester population potential.

b. In addition to the commmon constraints described in Section B above, other unique constraints were also used in order to help achieve the objectives of this Alternative. These additional constraints were incorporated into the development of the Alternative in one or more sequential FORPLAN runs for which the results are summarized in the following table. The purpose, rationale, and tradeoffs associated with each of these unique individual constraints or constraint sets, is discussed below.

TABLE B-VII-7

ANALYSIS OF CONSTRAINTS WITHIN ALTERNATIVE D

| FORPLAN RUN | PNV ($MM) | DISCOUNTED BENEFITS ($MM) | DISCOUNTED COSTS ($MM) | ASQ (MMCF/YR) | LRSY (MMCF/YR) |
|---|---|---|---|---|---|
| Benchmark 11 | 1077.2 | 1227.4 | 150.2 | 50.6 | 50.6 |
| Alt-D (Run-1) with added constraints: --Multiple res. obj. & allocations | 839.3 | 978.3 | 139.0 | 40.6 | 40.6 |
| Alt-D (Run-2) with added constraints: --LPP conversion | 748.0 | 899.4 | 151.4 | 41.3 | 41.3 |

(1) Land Allocation Constraints

(a) Purpose:

These constraints were applied so that the multiple resource land use pattern needed to achieve the objectives of this Alternative would be correctly represented across all of the FORPLAN analysis areas.

(b) Rationale:

Since many of the wildlife, recreation, and visual resources on the Forest are not represented with output and value coefficients in FORPLAN, in the absence of these constraints the Model would only have timber related values available to it for making land allocation choices. These constraints indicate how many acres of each analysis area should be allocated to particular multiple resource management emphases. FORPLAN then decides which schedule of management activities, and which level of capital investment is the most efficient in order to meet the overall objectives of the Alternative. These constraints also determine the number of acres to which the various common multiple use constraints discussed in the previous section are applied to. The breakdown of acres allocated to the various FORPLAN management emphases for this Alternative are displayed in the following table:

TABLE B-VII-8
FORPLAN MANAGEMENT EMPHASES ALLOCATIONS FOR ALTERNATIVE D

| MANAGEMENT EMPHASES | ACRES |
|---|---|
| General Forest | 677,172 |
| Scenic Views: | |
| Middleground | 106,286 |
| Retention Foreground | 65,179 |
| Partial Retention Foreground | 67,781 |
| Deer Habitat | 100,197 |
| Intensive Recreation | 49,134 |
| Threatened & Endangered Bird Species | 30,556 |
| Oregon Cascade Recreation Area | 42,650 |
| Wilderness | 182,394 |
| Other Management Areas (No Programed Cut) | 302,294 |
| TOTAL FOREST | 1,623,648 |

(c) Tradeoffs:

The timber related tradeoffs associated with the imposition of the multiple resource land allocation constraints can be obtained by comparing the results of BM-11 and Run-1 of Alternative D displayed in Table B-VII-7 above. Timber related outputs, discounted costs and benefits, and the PNV all dropped by about 20 percent. In the absence of these constraints, both the timber related present net value and outputs would be higher, while the other multiple resource outputs and associated values would be lower. However, without these constraints, the multiple use resource management objectives of this Alternative would not be satisfied.

(2) Constraints to Prohibit Programmed Timber Harvesting in Intensive Recreation Areas

(a) Purpose:

Often, the programming of timber harvesting in heavily used and visually sensitive recreation areas is a sensitive issue. Some forest managers believe that the silvicultural objectives in these areas can be achieved equally as well and with more flexibility if the harvesting in these areas is done on a non-programmed basis. These constraints prohibit the model from scheduling timber harvesting in intensive recreation areas.

(b) Rationale:

If it were not for these constraints, FORPLAN would schedule timber harvesting in these areas.

(c) Tradeoffs:

A separate run was not made to analyze the tradeoffs associated with imposing this set of constraints on this Alternative. However, based on the land allocations it is reasonable to assume that their impacts on this Alternative would be similar to those experienced in Alternative C. Run-1 in Table B-VII-7 already included the tradeoffs related to not permitting programmed timber harvesting on the 49,134 acres of CFL allocated to intensive recreation areas. Of the total decrease in timber outputs and benefits witnessed in that run as compared to BM-11, about 2 to 3 percent of them can be attributed to these constraints.

### (3) Lodgepole Pine 20-Year Conversion Constraints

(a) Purpose:

The Swatter EA was developed in 1981. It called for a 20 to 30 year conversion of mature and overmature lodgepole pine in order to recover as much utilizable wood fiber as possible before the beetles got to it, mitigate the impacts of accelerated harvesting in LPP on the other resources, and begin to convert these slow growing high risk stands to young vigorous managed stands. Entomologists are now predicting that in 15 or so years, 85 percent of the mature and overmature lodgepole stands will be dead due to beetle attacks. These constraints were used to force the model to convert the mature and overmature lodgepole pine stands to managed stands over the next 20 years.

(b) Rationale:

Without these constraints the model would not convert these stands until the third through the fifth decades. The mature lodgepole stands are expected to be mostly dead in 15 years. The dead trees may be utilizable as firewood for another ten years after death.

(c) Tradeoffs:

Since these constraints force the model to cut the lower valued lodgepole sooner than it normally would and usually result in at least some substitution of this lower valued species for the higher valued ponderosa pine, they lead to a decline in the present net value of the timber resource. The extent of the tradeoffs involved can be obtained by comparing Runs 1 and 2 in Table VII-7. While the imposition of these constraints actually led to an increase in the ASQ/LRSY from 40.6 MMCF/yr to 41.3 MMCF/yr, the resulting lower valued species mix caused the timber related PNV to drop from 839.3 $MM to 748.0 $MM.

### (4) Nondeclining Flow/Long Run Sustained Yield Constraints

(a) Purpose:

This set of constraints is designed to ensure that future harvest levels will never decline and that the harvest levels will be less than or equal to the long run sustained yield at the end of the harvest scheduling planning horizon.

(b) Rationale:

Without these constraints, harvest levels could rise and fall eradically.

(c) Tradeoffs:

Since both BM-11 and Alternative D schedule the harvesting of timber under nondeclining flow, the tradeoffs of imposing these constraints on this Alternative are not measurable by comparing the two. However, in general by imposing the nondeclining flow constraints, the model's flexibility to harvest timber in such a way as to maximize PNV is reduced. Therefore, early decade economic returns and timber output levels are traded off in exchange for stable long term harvest levels.

5. Alternative E (Preferred)

The purpose of Alternative E is to provide much the same opportunities and outputs as Alternatives B and F but by providing them from different areas of the Forest. It is designed to provide a balanced mix both amenity and commodity resource values. Timber outputs should be provided to meet anticipated regional and national demands for wood products as expressed through the RPA targets. Mule deer populations could increase some as well as bald eagle populations. The more sensitive areas of the Forest are not available for geothermal leasing. Undeveloped recreation opportunities would be available in roadless areas, Wildernesses, and the Oregon Cascade Recreation Area.

a. The criteria and assumptions underlying the development of this Alternative are:

(1) This Alternative will permit the accelerated harvesting of surplus old growth timber on the Forest in order to meet the RPA timber targets, and help to maintain a stable local economy. As such, a departure from nondeclining yield is acceptable, yet harvest levels should never fall below the long run sustained yield established under the base sales schedule for this Alternative.

(2) Mature and overmature lodgepole pine will be converted to managed stands over the next 15 to 20 years. No existing mature and overmature lodgepole will be utilizable after the conclusion of the third decade.

(3) Rotation ages will be based on 95 percent of CMAI except that ponderosa pine stands in deer winter range can be harvested at ages sooner than 95 percent CMAI in order to achieve thermal/cover objectives.

(4) Enough live snag replacement trees will be left after harvest to provide habitat for 60 percent of the cavity nester population potential.

(5) A balanced spectrum of develped and undeveloped recreation opportunities will be provided.

(6) Spotted owl habitat would be maintained at the current level while habitat for osprey, goshawks, and pine martens would decrease.

(7) Some Special Interest Areas will be provided to enhance the recreation expierence or provide for special biological features.

(8) Seven new Reasearch Natural Areas will be recommended for inclusion into the system.

(9) Portions of two rivers will be recommended for classification as Recreation Rivers under the Wild and Scenic Rivers Act.

b. In addition to the common constraints described in Section B above, other unique constraints were also used in order to help achieve the objectives of this Alternative. These additional constraints were incorporated into the development of the Alternative in one or more sequential FORPLAN runs for which the results are summarized in the following table. The purpose, rationale, and tradeoffs associated with each of these unique individual constraints, or constraint sets, is discussed below.

## TABLE B-VII-9

## ANALYSIS OF CONSTRAINTS WITHIN ALTERNATIVE E

| FORPLAN RUN | PNV ($MM) | DISCOUNTED BENEFITS ($MM) | DISCOUNTED COSTS ($MM) | ASQ (MMCF/YR) | LRSY (MMCF/YR) |
|---|---|---|---|---|---|
| Benchmark 11 | 1077.2 | 1227.4 | 150.2 | 50.6 | 50.6 |
| Alt-E (Run-1) with added constraints: --Multiple res. obj. & allocations | 809.6 | 943.0 | 133.4 | 38.9 | 38.9 |
| Alt-E (Run-2) with added constraints: --LPP conversion | 720.2 | 864.9 | 144.7 | 39.5 | 39.5 |
| Alt-E (Run-3) with added constraints: --Departure from NDF | 736.8 | 900.1 | 163.3 | 46.6 | 39.5 |

### (1) Land Allocation Constraints

(a) Purpose:

These constraints were applied so that the multiple resource land use pattern needed to achieve the objectives of this Alternative would be correctly represented across all of the FORPLAN analysis areas.

(b) Rationale:

Since many of the wildlife, recreation, and visual resources on the Forest are not represented with output and value coefficients in FORPLAN, in the absence of these constraints the Model would only have timber related values available to it for making land allocation choices. These constraints indicate how many acres of each analysis area should be allocated to particular multiple resource management emphases. FORPLAN then decides which schedule of management activities, and which level of capital investment is the most efficient in order to meet the overall objectives of the Alternative. These constraints also determine the number of acres to which the various common multiple use constraints discussed in the previous section are applied to. The breakdown of acres allocated to the various FORPLAN management emphases for this Alternative are displayed in the following table:

TABLE B-VII-10
FORPLAN MANAGEMENT EMPHASES ALLOCATIONS FOR ALTERNATIVE E

| MANAGEMENT EMPHASES | ACRES |
|---|---|
| General Forest | 688,839 |
| Scenic Views: | |
| Middleground | 92,775 |
| Retention Foreground | 54,890 |
| Partial Retention Foreground | 52,451 |
| Deer Habitat | 105,784 |
| Intensive Recreation | 36,690 |
| Threatened & Endangered Bird Species | 23,079 |
| Oregon Cascade Recreation Area | 42,650 |
| Wilderness | 182,394 |
| Other Management Areas (No Programed Cut) | 344,089 |
| TOTAL FOREST | 1,623,648 |

(c) Tradeoffs:

The tradeoffs associated with the imposition of these constraints can be determined by examining the differences betweem the results of BM-11 and Run-1 of Alternative E displayed in Table VII-9. The timber outputs and their related benefits declined about 24 percent from BM-11 to Run-1. Discounted timber management costs dropped about 11 percent. The net effect was that PNV decreased approximately 25 percent from 1077.2 $MM to 809.6 $MM. In the absence of these constraints, both the timber related present net value and outputs would be higher, while the other multiple resource outputs and associated values would be lower. However, without these constraints, the multiple use resource management objectives of this Alternative would not be satisfied.

(2) Constraints to Prohibit Programmed Timber Harvesting in Intensive Recreation Areas

(a) Purpose:

Often, the programming of timber harvesting in heavily used and visually sensitive recreation areas is a sensitive issue. Some forest managers believe that the silvicultural objectives in these areas can be achieved equally as well and with more flexibility if the harvesting in these areas is done on a non-programmed basis. These constraints prohibit the model from scheduling timber harvesting in intensive recreation areas.

(b) Rationale:

If it were not for these constraints, FORPLAN would schedule timber harvesting in these areas.

(c) Tradeoffs:

A separate run was not made to analyze the tradeoffs associated with imposing this set of constraints on this Alternative. However, based on the land allocations it is reasonable to assume that their impacts on this Alternative would be similar to those experienced in Alternative C. Run-1 in Table B-VII-9 already included the tradeoffs related to not permitting programmed timber harvesting on the 36,690 acres of CFL allocated to intensive recreation areas. Of the total decrease in timber outputs and benefits witnessed in that run as compared to BM-11, about 2 percent of them can be attributed to these constraints.

(3) Lodgepole Pine 15-20 Year Conversion Constraints

(a) Purpose:

The Swatter EA was developed in 1981. It called for a 20- to 30-year conversion of mature and overmature lodgepole pine in order to recover as much utilizable wood fiber as possible before the beetles got to it, mitigate the impacts of accelerated harvesting in LPP on the other resources, and begin to convert these slow growing high risk stands to young vigorous managed stands. Entomologists are now predicting that in 15 or so years, 85 percent of the mature and overmature lodgepole stands will be dead due to beetle attacks. These constraints were used to force the model to convert the mature and overmature lodgepole pine stands to managed stands in general forest over the next 15 years and in sensitive visual and recreation areas over the next 20 years.

(b) Rationale:

Without these constraints the model would not convert these stands until the third through the fifth decades. The mature lodgepole stands are expected to be mostly dead in 15 years. The dead trees may be utilizable as firewood for another ten years after death.

(c) Tradeoffs:

Since these constraints force the model to cut the lower valued lodgepole sooner than it normally would and usually result in at least some substitution of this lower valued species for the higher valued ponderosa pine, they lead to a decline in the present net value of the timber resource. The differences between Run-1 and Run-2 in Table B-VII-9 display the impacts associated with the constraints used to accelerate the harvesting of mature and overmature lodgepole. While both the ASQ and the LRSY actually increased as a result of using these constraints, lower valued species mix led to lower discounted benefits, higher discounted costs, and an overall decrease in the timber PNV from 809.2 $MM to 720.2 $MM.

(4) Departure Harvest Flow/Long Run Sustained Yield and RPA Floor Constraints

(a) Purpose:

One of the primary objectives of this Alternative is to meet the RPA program timber targets and provide some stability to the local wood products industries. Departing from nondeclining yield in order to harvest surplus old growth inventory is an exceptable means of accomplishing these objectives. These constraints permitted the harvest schedule to deviate from one decade to the next by a maximum of 5 percent while meeting the RPA timber targets for the first five decades, and never dropping below the LRSY level established in the original base schedule run for this Alternative.

(b) Rationale:

Surplus old growth forests may consider departing from nondeclining yield as a means of prohibiting excessive losses due to mortality. By permitting the harvest schedule to depart from nondeclining flow, this Alternative becomes better balanced from a multiple resource management perspective since under nondeclining flow its timber program was not only relatively low, it was also composed of a relatively low valued species mix.

(c) Tradeoffs:

By allowing the harvest schedule to depart from nondeclining flow, the first decade harvest levels increased from 39.5 MMCF/yr under nondeclining flow to 46.6 MMCF/yr, and the PNV of the timber program increased from 720.2 $MM to 736.8 $MM. Consequently, the implications regarding jobs, personal income, and returns to the Government also showed some improvement.

6. Alternative F

The purpose of this Alternative is to provide moderate levels of goods and services while providing for undeveloped recreation, old growth, and visual quality. Visual quality is provided for along the major roads and some of the more prominant buttes. Wood production is higher than current direction. Much of the high potential geothermal areas are available for leasing. Some of the more sensitive areas are not. Mule deer populations could increase some. Some of the roadless areas are developed and some are not. The opportunity for undeveloped recreation is available in roadless areas, the Wildernesses, and the Oregon Cascade Recreation Area.

a. The criteria and assumptions underlying the development of this Alternative are:

(1) The harvest schedule will be based upon nondeclining flow.

(2) Mature and overmature lodgepole pine will be converted to managed stands over the next 20 years. No existing mature and overmature lodgepole will be utilizable after the conclusion of the third decade.

(3) Rotation ages will be based on 95 percent of CMAI except that ponderosa pine stands in deer winter range can be harvested at ages sooner than 95 percent CMAI in order to achieve thermal/cover objectives.

(4) Enough live snag replacement trees will be left after harvest to provide habitat for 60 percent of the cavity nester population potential.

(5) A wide range of developed, undeveloped, and winter recreation opportunities will be provided in response to the recreation issues.

(6) Provide wildlife habitat that will allow increases in populations of bald eagles and cavity nesting species. Maintain spotted owls and mule deer near their current levels. Habitat for osprey and some other species will be provided at reduced levels.

(7) Some Special Interest Areas will be provided to enhance the recreation opportunity.

(8) Seven new Research Natural Areas will be proposed for inclusion into the system.

(9) A portion of one river will be recommended for classification as a Recreation River under the Wild and Scenic Rivers Act.

b. In addition to the commmon constraints described in Section B above, other unique constraints were also used in order to help achieve the objectives of this Alternative. These additional constraints were incorporated into the development of the Alternative in one or more sequential FORPLAN runs for which the results are summarized in the following table. The purpose, rationale, and tradeoffs associated with each of these unique individual constraints, or constraint sets, is discussed below.

TABLE B-VII-11

ANALYSIS OF CONSTRAINTS WITHIN ALTERNATIVE F

| FORPLAN RUN | PNV ($MM) | DISCOUNTED BENEFITS ($MM) | DISCOUNTED COSTS ($MM) | ASQ (MMCF/YR) | LRSY (MMCF/YR) |
|---|---|---|---|---|---|
| Benchmark 11 | 1077.2 | 1227.4 | 150.2 | 50.6 | 50.6 |
| Alt-F (Run-1) with added constraints:<br>--Multiple res. obj. & allocations | 805.8 | 939.9 | 134.1 | 38.7 | 38.7 |
| Alt-F (Run-2) with added constraints: | 727.9 | 871.5 | 143.5 | 39.2 | 39.2 |

(1) Land Allocation Constraints

(a) Purpose:

These constraints were applied so that the multiple resource land use pattern needed to achieve the objectives of this Alternative would be correctly represented across all of the FORPLAN analysis areas.

(b) Rationale:

Since many of the wildlife, recreation, and visual resources on the Forest are not represented with output and value coefficients in FORPLAN, in the absence of these constraints the Model would only have timber related values available to it for making land allocation choices. These constraints indicate how many acres of each analysis area should be allocated to particular multiple resource management emphases. FORPLAN then decides which schedule of management activities, and which level of capital investment is the most efficient in order to meet the overall objectives of the Alternative. These constraints also determine the number of acres to which the various common multiple use constraints discussed in the previous section are applied to. The breakdown of acres allocated to the various FORPLAN management emphases for this Alternative are displayed in the following table:

TABLE B-VII-12
FORPLAN MANAGEMENT EMPHASES ALLOCATIONS FOR ALTERNATIVE F

| MANAGEMENT EMPHASES | ACRES |
|---|---|
| General Forest | 685,127 |
| Scenic Views: | |
| Middleground | 78,354 |
| Retention Foreground | 61,249 |
| Partial Retention Foreground | 57,150 |
| Deer Habitat | 105,911 |
| Intensive Recreation | 33,043 |
| Threatened & Endangered Bird Species | 22,422 |
| Oregon Cascade Recreation Area | 42,650 |
| Wilderness | 182,394 |
| Other Management Areas (No Programed Cut) | 355,348 |
| TOTAL FOREST | 1,623,648 |

(c) Tradeoffs:

The tradeoffs associated with these constraints can be determined by comparing the results of BM-11 and Run-1 displayed in Table VII-11. The PNV dropped approximately 25 percent from 1077.2 $MM in BM-11 to 805.8 $MM for Run-1 of Alternative F. This reflects the net result of a 24 percent decline in timber related outputs and benefits, and a 11 percent reduction in discounted timber management costs. In the absence of these constraints, both the timber related present net value and outputs would be higher, while the other multiple resource outputs and associated values would be lower. However, without these constraints, the multiple use resource management objectives of this Alternative would not be satisfied.

(2) Constraints to Prohibit Programmed Timber Harvesting in Intensive Recreation Areas

(a) Purpose:

Often, the programming of timber harvesting in heavily used and visually sensitive recreation areas is a sensitive issue. Some forest managers believe that the silvicultural objectives in these areas can be achieved equally as well and with more flexibility if the harvesting in these areas is done on a non-programmed basis. These constraints prohibit the model from scheduling timber harvesting in intensive recreation areas.

(b) Rationale:

If it were not for these constraints, FORPLAN would schedule timber harvesting in these areas.

(c) Tradeoffs:

A separate run was not made to analyze the tradeoffs associated with imposing this set of constraints on this Alternative. However, based on the land allocations it is reasonable to assume that their impacts on this Alternative would be similar to those experienced in Alternative C. Run-1 in Table B-VII-11 already included the tradeoffs related to not permitting programmed timber harvesting on the 33,043 acres allocated to intensive recreation areas. Of the total decrease in timber outputs and benefits witnessed in that run as compared to BM-11, about 2 percent of them can be attributed to these constraints.

(3) Lodgepole Pine 20 Year Conversion Constraints

(a) Purpose:

The Swatter EA was developed in 1981. It called for a 20- to 30-year conversion of mature and overmature lodgepole pine in order to recover as much utilizable wood fiber as possible before the beetles got to it, mitigate the impacts of accelerated harvesting in LPP on the other resources, and begin to convert these slow growing high risk stands to young vigorous managed stands. Entomologists are now predicting that in 15 or so years, 85 percent of the mature and overmature lodgepole stands will be dead due to beetle attacks. These constraints were used to force the model to convert the mature and overmature lodgepole pine stands to managed stands over the next 20 years.

(b) Rationale:

Without these constraints the model would not convert these stands until the third through the fifth decades. The mature lodgepole stands are expected to be mostly dead in 15 years. The dead trees may be utilizable as firewood for another ten years after death.

(c) Tradeoffs:

Since these constraints force the model to cut the lower valued lodgepole sooner than it normally would and usually result in at least some substitution of this lower valued species for the higher valued ponderosa pine, they lead to a decline in the present net value of the timber resource. The differences between Run-1 and Run-2 in Table B-VII-10 display the impacts associated with the constraints used to accelerate the harvesting of mature and overmature lodgepole. While both the ASQ and the LRSY actually increased as a result of using these constraints, the lower valued species mix led to lower discounted benefits, higher discounted costs, and an overall decrease in the timber PNV from 805.8 $MM to 727.9 $MM.

(4) Nondeclining Flow/Long Run Sustained Yield Constraints

(a) Purpose:

This set of constraints is designed to assure that future harvest levels will never decline and that the harvest levels will be less than or equal to the long run sustained yield at the end of the harvest scheduling planning horizon.

(b) Rationale:

Without these constraints, harvest levels could rise and fall eradically.

(c) Tradeoffs:

Since both BM-11 and Alternative F schedule the harvesting of timber under nondeclining flow, the tradeoffs of imposing these constraints on this Alternative are not measurable by comparing the two. However, in general by imposing the nondeclining flow constraints, the model's flexibility to harvest timber in such a way as to maximize PNV is reduced. Therefore, early decade economic returns and timber output levels are traded off in exchange for stable long term harvest levels.

7. Alternative G

The purpose of this Alternative is to address the ICO's related to undeveloped lands and using the National Forest to provide for non-market types of outputs. High levels of undeveloped lands, old growth, and watchable wildlife are provided. Lots of opportunities for dispersed recreation in a natural forest are available while limited opportunities for developed receation are provided. Geothermal leasing opportunities are limited. Mule deer populations would be reduced while habitat for osprey and cavity nesting species would be increased. Visual quality is provided for along roads, trails and on the prominent buttes.

a. The criteria and assumptions underlying the development of this Alternative are:

(1) The timber outputs will be developed using the principals of non-declining yield since commodity outputs are not emphasized in this Alternative.

(2) Mature and overmature lodgepole pine will be converted to managed stands over the next 30 years. No existing mature and overmature lodgepole will be utilizable after the conclusion of the third decade.

(3) Rotation ages will be based on 95 percent of CMAI except that ponderosa pine stands in deer winter range can be harvested at ages sooner than 95 percent CMAI in order to achieve thermal/cover objectives.

(4) Enough live snag replacement trees will be left after harvest to provide habitat for 80 percent of the cavity nester population potential.

(5) Use of the Forest by cattle and sheep would be maintained at the current level.

(6) Opportunity for developed recreation will be limited.

(7) Habitat for bald eagles, spotted owls, cavity nesters, and osprey will be increased.

(8) Interpretation and protection of all potential Special Interest Areas will be provided for in this Alternative.

(9) Seven new Research Natural Areas will be provided for in this Alternative.

(10) Portions of 4 rivers will be recommended for classification as Recreation Rivers under the Wild and Scenic Rivers Act and a portion of one is recommended for a Scenic classifcation.

(11) Any development of the roadless areas for timber management purposes will be prohibited.

b. In addition to the commmon constraints described in Section B above, other unique constraints were also used in order to help achieve the objectives of this Alternative. These additional constraints were incorporated into the development of the Alternative in one or more sequential FORPLAN runs for which the results are summarized in the following table. The purpose, rationale, and tradeoffs associated with each of these unique individual constraints, or constraint sets, is discussed below.

## TABLE B-VII-13

## ANALYSIS OF CONSTRAINTS WITHIN ALTERNATIVE G

| FORPLAN RUN | PNV ($MM) | DISCOUNTED BENEFITS ($MM) | DISCOUNTED COSTS ($MM) | ASQ (MMCF/YR) | LRSY (MMCF/YR) |
|---|---|---|---|---|---|
| Benchmark 11 | 1077.2 | 1227.4 | 150.2 | 50.6 | 50.6 |
| Alt-G (Run-1) with added constraints: --Multiple res. obj. & allocations | 737.0 | 858.0 | 121.0 | 35.5 | 35.5 |
| Alt-G (Run-2) with added constraints: --LPP conversion | 680.4 | 814.6 | 134.3 | 37.2 | 37.2 |
| Alt-G (Run-3) with added constraints: --No programed cut in vis. foreground | 615.3 | 726.2 | 110.9 | 32.7 | 32.7 |

### (1) Land Allocation Constraints

(a) Purpose:

These constraints were applied so that the multiple resource land use pattern needed to achieve the objectives of this Alternative would be correctly represented across all of the FORPLAN analysis areas.

(b) Rationale:

Since many of the wildlife, recreation, and visual resources on the Forest are not represented with output and value coefficients in FORPLAN, in the absence of these constraints the Model would only have timber related values available to it for making land allocation choices. These constraints indicate how many acres of each analysis area should be allocated to particular multiple resource management emphases. FORPLAN then decides which schedule of management activities, and which level of capital investment is the most efficient in order to meet the overall objectives of the Alternative. These constraints also determine the number of acres to which the various common multiple use constraints discussed in the previous

section are applied to. The breakdown of acres allocated to the various FORPLAN management emphases for this Alternative are displayed in the following table:

TABLE B-VII-14
FORPLAN MANAGEMENT EMPHASES ALLOCATIONS FOR ALTERNATIVE G

| MANAGEMENT EMPHASES | ACRES |
|---|---|
| General Forest | 695,296 |
| Scenic Views: | |
| Middleground | 38,733 |
| Retention Foreground | 47,997 |
| Partial Retention Foreground | 65,554 |
| Deer Habitat | 60,007 |
| Intensive Recreation | 22,558 |
| Threatened & Endangered Bird Species | 29,890 |
| Oregon Cascade Recreation Area | 42,650 |
| Wilderness | 182,394 |
| Other Management Areas (No Programed Cut) | 438,615 |
| TOTAL FOREST | 1,623,648 |

(c) Tradeoffs:

The tradeoffs associated with these constraints can be determined by comparing the results of BM-11 and Run-1 displayed in Table B-VII-13. The PNV dropped approximately 32 percent from 1077.2 $MM in BM-11 to 737.0 $MM for Run-1 of Alternative G. This reflects the net result of a 30 percent decline in timber related outputs and benefits, and a 19 percent reduction in discounted timber management costs. In the absence of these constraints, both the timber related present net value and outputs would be higher, while the other multiple resource outputs and associated values would be lower. However, without these constraints, the multiple use resource management objectives of this Alternative would not be satisfied.

(2) Constraints to Prohibit Programmed Timber Harvesting in Intensive Recreation Areas

(a) Purpose:

Often, the programming of timber harvesting in heavily used and visually sensitive recreation areas is a sensitive issue. Some forest managers believe that the silvicultural objectives in these areas can be achieved equally as well and with more flexibility if the harvesting in these areas is done on a non-programmed basis. These constraints prohibit the model from scheduling timber harvesting on the 22,558 acres of CFL allocated to intensive recreation.

(b) Rationale:

If it were not for these constraints, FORPLAN would schedule timber harvesting in these areas.

(c) Tradeoffs:

A separate run was not made to analyze the tradeoffs associated with imposing this set of constraints on this Alternative. However, based on the land allocations it is reasonable to assume that their impacts on this Alternative would be similar to those experienced in Alternative C. Run-1 in Table B-VII-13 already included the tradeoffs related to not permitting programmed timber harvesting on the 22,558 acres of CFL allocated to intensive recreation areas. Of the total decrease in timber outputs and benefits witnessed in that run as compared to BM-11, about 2 percent of them can be attributed to these constraints.

(3) Lodgepole Pine 30 Year Conversion Constraints

(a) Purpose:

The Swatter EA was developed in 1981. It called for a 20- to 30-year conversion of mature and overmature lodgepole pine in order to recover as much utilizable wood fiber as possible before the beetles got to it, mitigate the impacts of accelerated harvesting in LPP on the other resources, and begin to convert these slow growing high risk stands to young vigorous managed stands. Entomologists are now predicting that in 15 or so years, 85 percent of the mature and overmature lodgepole stands will be dead due to beetle attacks. These constraints were used to force the model to convert the mature and overmature lodgepole pine stands to managed stands over the next 30 years.

(b) Rationale:

Without these constraints the model would not convert these stands until the third through the fifth decades. The mature lodgepole stands are expected to be mostly dead in 15 years. The dead trees may be utilizable as firewood for another ten years after death.

(c) Tradeoffs:

Since these constraints force the model to cut the lower valued lodgepole sooner than it normally would and usually result in at least some substitution of this lower valued species for the higher valued ponderosa pine, they lead to a decline in the present net value of the timber resource. The differences between Run-1 and Run-2 in Table B-VII-13 display the impacts associated with the constraints used to accelerate the harvesting of mature and overmature lodgepole. While both the ASQ and the LRSY actually increased as a result of using these constraints, the lower valued species mix led to lower discounted benefits, higher discounted costs, and an overall decrease in the timber PNV from 737.0 $MM to 680.4 $MM.

(4) Constraints to Prohibit Programmed Timber Harvesting in Scenic Views Management Areas

(a) Purpose:

Often, the programming of timber harvesting in heavily used and visually important areas is a sensitive issue. Some forest managers believe that the silvicultural objectives in these areas can be achieved equally as well and with more flexibility if the harvesting in these areas is done on a non-programed basis. These constraints prohibit the model from scheduling timber harvesting on the 113,551 acres of CFL allocated to visual foreground management.

(b) Rationale:

If it were not for these constraints, FORPLAN would schedule timber harvesting in these areas.

(c) Tradeoffs:

The tradeoffs resulting from the imposition of these constraints can be determined by comparing Runs 2 and 3 in Table B-VII-13. Timber outputs and their associated discounted benefits dropped 11 to 12 percent. On the other hand, discounted timber management costs decreased nearly 18 percent due to the higher costs of doing business in these visually sensitive areas. The net result was that PNV decreased about 10 percent due to the imposition of these constraints on Alternative G.

(5) Nondeclining Flow/Long Run Sustained Yield Constraints

(a) Purpose:

This set of constraints is designed to assure that future harvest levels will never decline and that the harvest levels will be less than or equal to the long run sustained yield at the end of the harvest scheduling planning horizon.

(b) Rationale:

Without these constraints, harvest levels could rise and fall eradically.

(c) Tradeoffs:

Since both BM-11 and Alternative G schedule the harvesting of timber under nondeclining flow, the tradeoffs of imposing these constraints on this Alternative are not measurable by comparing the two. However, in general by imposing the nondeclining flow constraints, the model's flexibility to harvest timber in such a way as to maximize PNV is reduced. Therefore, early decade economic returns and timber output levels are traded off in exchange for stable long term harvest levels.

8. Alternative H

The purpose of this Alternative is to retain much of the roadless area in an undevloped condition while keeping outputs of goods and services up on the remaining developed portions of the Forest. Visual quality is provided for on the more sensitive roads and buttes. Only a portion of the high potential areas on the Forest would be available for geothermal leasing. Habitat for mule deer would be provided at levels lower than is currently being done. Opportunities for recreating in undeveloped land would be high as well as opportunities for developed recreation.

a. The criteria and assumptions underlying the development of this Alternative are:

(1) This Alternative will permit a departure from nondeclining yield in order to maintain current wood output levels on the reduced timber land base.

(2) Mature and overmature lodgepole pine will be converted to managed stands over the next 20 years in general forest areas and 30 years in sensitive visual and recreation areas. No existing mature and overmature lodgepole will be utilizable after the conclusion of the third decade.

(3) Rotation ages will be based on 95 percent of CMAI except that ponderosa pine stands in deer winter range can be harvested at ages sooner than 95 percent CMAI in order to achieve thermal/cover objectives.

(4) Enough live snag replacement trees will be left after harvest to provide habitat for 80 percent of the cavity nester population potential.

(5) Populations of mule deer would be at levels below current numbers. Bald eagle habitat would be increased and osprey habitat would be maintained at current levels.

(6) Special Interest Areas will be provided enhance the recreation and educational opportunities.

(7) Seven new Reaearch Natural Areas will be proposed for addition to the system.

(8) Portions of two rivers will be recommended for classification as Recreation Rivers under the Wild and Scenic Rivers Act and a section of one is also recommended for classification as Scenic.

b. In addition to the commmon constraints described in Section B above, other unique constraints were also used in order to help achieve the objectives of this Alternative. These additional constraints were incorporated into the development of the Alternative in one or more sequential FORPLAN runs for which the results are summarized in the following table. The purpose, rationale, and tradeoffs associated with each of these unique individual constraints, or constraint sets, is discussed below.

## TABLE B-VII-15

## ANALYSIS OF CONSTRAINTS WITHIN ALTERNATIVE H

| FORPLAN RUN | PNV ($MM) | DISCOUNTED BENEFITS ($MM) | DISCOUNTED COSTS ($MM) | ASQ (MMCF/YR) | LRSY (MMCF/YR) |
|---|---|---|---|---|---|
| Benchmark 11 | 1077.2 | 1227.4 | 150.2 | 50.6 | 50.6 |
| Alt-H (Run-1) with added constraints:<br>--Multiple res. obj. & allocations | 744.1 | 865.8 | 121.7 | 35.9 | 35.9 |
| Alt-H (Run-2) with added constraints:<br>--LPP conversion | 668.4 | 800.0 | 131.5 | 36.3 | 36.3 |
| Alt-H (Run-3) with added constraints:<br>--Departure from NDF | 671.2 | 827.8 | 156.6 | 41.7 | 36.3 |

(1) Land Allocation Constraints

(a) Purpose:

These constraints were applied so that the multiple resource land use pattern needed to achieve the objectives of this Alternative would be correctly represented across all of the FORPLAN analysis areas.

(b) Rationale:

Since many of the wildlife, recreation, and visual resources on the Forest are not represented with output and value coefficients in FORPLAN, in the absence of these constraints the Model would only have timber related values available to it for making land allocation choices. These constraints indicate how many acres of each analysis area should be allocated to particular multiple resource management emphases. FORPLAN then decides which schedule of management activities, and which level of capital investment is the most efficient in order to meet the overall objectives of the Alternative. These constraints also determine the number of acres to which the various common multiple use constraints discussed in the previous

section are applied to. The breakdown of acres allocated to the various FORPLAN management emphases for this Alternative are displayed in the following table:

TABLE VII-16
FORPLAN MANAGEMENT EMPHASES ALLOCATIONS FOR ALTERNATIVE H

| MANAGEMENT EMPHASES | ACRES |
|---|---|
| General Forest | 746,962 |
| Scenic Views: | |
| Middleground | 30,497 |
| Retention Foreground | 43,387 |
| Partial Retention Foreground | 48,310 |
| Deer Habitat | 48,570 |
| Intensive Recreation | 23,682 |
| Threatened & Endangered Bird Species | 31,738 |
| Oregon Cascade Recreation Area | 42,650 |
| Wilderness | 182,394 |
| Other Management Areas (No Programed Cut) | 425,460 |
| TOTAL FOREST | 1,623,648 |

(c) Tradeoffs:

The tradeoffs associated with the imposition of these constraints can be determined by examining the differences betweem the results of BM-11 and Run-1 of Alternative H displayed in Table B-VII-15. The timber outputs and their related benefits declined about 29 percent from BM-11 to Run-1. Discounted timber management costs dropped about 19 percent. The net effect was that PNV decreased approximately 31 percent from 1077.2 $MM to 744.1 $MM. In the absence of these constraints, both the timber related present net value and outputs would be higher, while the other multiple resource outputs and associated values would be lower. However, without these constraints, the multiple use resource management objectives of this Alternative would not be satisfied.

### (2) Constraints to Prohibit Programmed Timber Harvesting in Intensive Recreation Areas

(a) Purpose:

Often, the programming of timber harvesting in heavily used and visually sensitive recreation areas is a sensitive issue. Some forest managers believe that the silvicultural objectives in these areas can be achieved equally as well and with more flexibility if the harvesting in these areas in done on a non-programmed basis. These constraints prohibit the model from scheduling timber harvesting in intensive recreation areas.

(b) Rationale:

If it were not for these constraints, FORPLAN would schedule timber harvesting in these areas.

(c) Tradeoffs:

A separate run was not made to analyze the tradeoffs associated with imposing this set of constraints on this Alternative. However, based on the land allocations it is reasonable to assume that their impacts on this Alternative would be similar to those experienced in Alternative C. Run-1 in Table B-VII-15 already included the tradeoffs related to not permitting programmed timber harvesting on the 23,682 acres of CFL allocated to intensive recreation areas. Of the total decrease in timber outputs and benefits witnessed in that run as compared to BM-11, about 2 percent of them can be attributed to these constraints.

### (3) Lodgepole Pine 20-30 Year Conversion Constraints

(a) Purpose:

The Swatter EA was developed in 1981. It called for a 20- to 30-year conversion of mature and overmature lodgepole pine in order to recover as much utilizable wood fiber as possible before the beetles got to it, mitigate the impacts of accelerated harvesting in LPP on the other resources, and begin to convert these slow growing high risk stands to young vigorous managed stands. Entomologists are now predicting that in 15 or so years, 85 percent of the mature and overmature lodgepole stands will be dead due to beetle attacks. These constraints were used to force the model to convert the mature and overmature lodgepole pine stands to managed stands over the next 20 to 30 years.

(b) Rationale:

Without these constraints the model would not convert these stands until the third through the fifth decades. The mature lodgepole stands are expected to be mostly dead in 15 years. The dead trees may be utilizable as firewood for another ten years after death.

(c) Tradeoffs:

Since these constraints force the model to cut the lower valued lodgepole sooner than it normally would and usually result in at least some substitution of this lower valued species for the higher valued ponderosa pine, they lead to a decline in the present net value of the timber resource. The differences between Run-1 and Run-2 in Table B-VII-15 display the impacts associated with the constraints used to accelerate the harvesting of mature and overmature lodgepole. While both the ASQ and the LRSY actually increased as a result of using these constraints, the lower valued species mix led to lower discounted benefits, higher discounted costs, and an overall decrease in the timber PNV from 744.1 $MM to 668.4 $MM.

(4) Departure Harvest Flow/Long Run Sustained Yield and Current Direction Floor Constraints

(a) Purpose:

One of the primary objectives of this Alternative is to maintain near current harvest levels on a reduced timber land base. Departing from nondeclining yield in order to harvest surplus old growth inventory is an exceptable means of accomplishing this objective. These constraints permitted the harvest schedule to deviate from one decade to the next by a maximum of 10 percent while meeting the Current Direction LRSY levels for the first five decades.

(b) Rationale:

Under nondeclining yield and the reduced land base, the wood outputs from this Alternative were considerably lower than those of the Current Direction Alternative (LRSY of 357.5 MMCF vs 406.7

MMCF). By permitting the harvest schedule to depart from nondeclining flow, this Alternative was able to meet or exceed the current harvest levels for five decades before dropping down to approximately 75 percent of the current levels and then climbing back to its LRSY level established in the base schedule run.

(c) Tradeoffs:

By allowing the harvest schedule to depart from nondeclining flow, the first decade harvest levels increased from 36.3 MMCF/yr under nondeclining flow to 41.7 MMCF/yr, and the PNV of the timber program increased from 668.4 $MM to 671.2 $MM. Consequently, the implications regarding jobs, personal income, and returns to the government also showed some improvement.

# VIII. EFFECTS OF BENCHMARKS, CONSTRAINTS, AND ALTERNATIVES

## A. Introduction

This section provides a detailed discussion of the outputs and effects of the DEIS Alternatives. The focus is upon the tradeoffs between the Alternatives as they provide different levels and mixes of goods and services, and as they address the planning ICO's in different ways. The purpose of presenting a discussion pertaining to the outputs and effects of each alternative, the consequences of the constraints used to help formulate them, and their relationship to the benchmarks, is to facilitate the identification of the alternative which comes closest to maximizing net public benefits. In order to accomplish this objective, there needs to be an understanding of the abilities of the Forest to produce different goods and services in response to the ICO's, and the tradeoffs involved with the decisions to produce one mix of outputs as opposed to another. As such, this comparative analysis provides the basis for selecting a proposed action, which is Step 8 of the planning process.

## B. Process for Evaluating Significant Constraints

The multiple resource management objectives associated with a particular benchmark or land management alternative were represented in FORPLAN as a combination of constraints, and an objective function. The objective function was usually "maximize present net value". This objective function guided the FORPLAN model in the selection of the most economically efficient combination of prescriptions, activity scheduling choices, and resource output levels which satisfied the multiple resource management objectives of a particular benchmark or alternative.

However, the maximization of present net value was subject to first satisfying all of the constraints which were used to represent the other resource management objectives not provided for by the economic efficiency objective function. The imposition of the constraints often, but not always, reduced the PNV for a particular alternative. The PNV given up in response to achieving the objectives of a constraint is referred to as the "opportunity cost". In order to isolate the opportunity cost associated with a particular constraint, or set of constraints, the resulting solutions of FORPLAN runs made with and without the constraints included in them were examined for their differences in PNV (and other outputs and effects of interest). As long as the only difference between the runs being compared was the addition of the constraints, the reduction in PNV represented the opportunity cost (at the margin) of achieving the constraint's objective.

During the Benchmark Analyses, constraint sets which were needed in order to achieve the various multiple resource management objectives were developed and evaluated. For example, all of the different constraints which were proposed in order to achieve the MMR's were evaluated both individually, and collectively, to determine the magnitude of their tradeoffs, and to assess the relative efficiency of alternative constraint sets designed to achieve common objectives. If one set of constraints achieved a particular objective with less impact on the PNV than an alternative set of constraints designed to accomplish the same purpose, it was considered more efficient and was used throughout the remainder of the process of developing and analyzing alternatives. Sometimes, alternative approaches to formulating constraints to meet a common objective were not available. In these cases, the analysis was performed solely to determine the opportunity costs associated with the constraints.

Discretionary constraints (those not legally required) were also examined in order to assess the magnitude of their opportunity costs. These constraints were often used in conjunction with special prescriptions in order to produce the desired multiple resource management objectives (i.e., visual quality, wildlife habitat, recreation settings, etc.) of an alternative. The policy constraints associated with nondeclining flow and rotations based on CMAI were also evaluated in the context of their effects on PNV and timber output levels. Finally, sensitivity analyses were performed in order to provide information regarding the consequences involved in making assumptions about timber management costs, and future stumpage values (i.e., price trends).

The results of these analyses are provided in the "Summary of the Analysis of the Management Situation" planning document, and in Chapter VI of this Appendix. Since they are discussed in detail in these documents, they will not be repeated here.

The opportunity costs associated with the individual constraints in each alternative were not evaluated due do the prohibitive costs of performing this type of analysis. However, many of the constraints used to formulate the alternatives were examined in the Benchmarks, so their approximate trade-offs can be determined from that analysis. Also, each alternative was developed and analyzed with a sequence of three to seven FORPLAN runs in which the differences between the solutions were examined in order to determine the tradeoffs and effects associated with the collective group of constraints added from one run to the next. This analysis was usually performed to help develop and refine the constraints which were unique to each alternative as was discussed in Chapter VII of this Appendix. Finally, by comparing the alternatives in their final forms, the economic tradeoffs of their different collective multiple resource management objectives was assessed. These efficiency tradeoffs were then compared to the environmental and socio-economic consequences in order to help identify the alternative, or alternatives, which came closest to maximizing net public benefits.

## C. Analysis of Tradeoffs Among Alternatives

In this section, the tradeoffs between the alternatives are discussed. The focus will be upon the resolution of ICO's, resource outputs, environmental consequences, economic and social effects, and the overall tradeoffs incurred in attempting to address the ICO's.

### 1. Responses to Major ICO's or Groups of ICO's

Except for Alternative A, which was designed to portray the outputs and effects associated with continuing on with current management direction, the alternatives were specifically tailored to reflect different ways of addressing the planning issues, concerns, and opportunities. The following discussion highlights some of the variation in the way the major issues were treated between them. Table B-VIII-1 tabularly summarizes these differences. For a more complete description of the ICO's and the role they played in the forest planning process, refer to Appendix A. Chapter II of the DEIS and the following portions of this Appendix present the detailed outputs and effects of the alternatives with regards to their responses to the ICO's.

The factors relating to the timber issues key around how much and what kind of timber will be sold on an annual basis. This was addressed in the alternatives by varying how much of the Forest was available for timber production, and by exploring departure timber schedules in order to achieve higher wood outputs than could be produced under nondeclining flow. The resulting wood outputs were expressed in terms of average annual millions of cubic feet, and average annual millions of board feet. These outputs were also estimated for the four timber working groups: 1) ponderosa pine, 2) lodgepole pine, 3) mixed conifer, and 4) mountain hemlock.

The factors relating to the wildlife issues key around what the population levels should be for certain key species such as mule deer, osprey, bald eagles, spotted owls, and pine martens. The issues were treated by applying prescriptions to appropriate areas of the Forest in order to provide habitat which could support more or less numbers than currently exist. While population numbers were estimated for deer, numbers of pairs were estimated for the other species.

Components of the recreation issues centered around providing a wide spectrum of opportunities for both undeveloped and developed recreation. Dispersed recreation was also a consideration. The alternatives varied in the amount and diversity of recreation opportunities which they offered over the long term. The output levels were estimated and expressed in terms of millions of recreation visitor days per year. Diversity was measured in terms of the number of acres of developed or undeveloped recreation provided in each alternative. The variety of opportunities provided by each alternative was also tempered with subjective evaluations.

Related to the recreation issues are concerns about visual quality. This issue was addressed in the alternatives by applying prescriptions which provide for visual quality to different areas of the Forest. The extent to which visual quality was provided for in each alternative was measured by the number of acres where visual quality objectives were met in sensitive scenic areas. The more sensitive areas were in the categories of retention and partial retention.

The thrust of the geothermal issue is where on the Forest should geothermal leasing and development be provided for. The Forest was mapped by categories of high, medium and low geothermal potential. Many of the high potential areas include roadless areas or areas with high recreation values. Specific data on the geothermal resource is not available at this time so effects of leasing and development could not be estimated. What was estimated was the acres potentially available for leasing by the categories of high, medium, and low. Each alternative varied which areas would be available for leasing and which would not.

The availability of personal use firewood is a key local issue. A range of options from making no special provisions for personal use firewood to fully meeting the demands for it were explored in the alternatives. The amount provided was expressed in terms of thousands of cords per year.

A broad issue encompasses lifestyles and economics. Many people live and/or recreate in Central Oregon because of the clean environment that is present and the variety of recreation and job opportunities that exist. Many people are willing to sacrifice economic growth in favor of clean air and water, good fishing, and the freedom to cut personal use firewood. However, jobs and personal income are also a concern in relation to lifestyles. The consequences of the alternatives with respect to this broad issue were estimated by examining a variety of outputs and effects. They are 1) jobs, 2) recreation opportunity, 3) firewood, 4) visual quality, and 5) revenues and payments to the counties.

Table B-VIII-1
COMPARISON OF ISSUE AND CONCERN RESOLUTION BY ALTERNATIVE

| Issues and Concerns | Outputs or Effects To Be Measured | Current Direction (A) | RPA (B) | Alt. C | Alt. D |
|---|---|---|---|---|---|
| Local and Regional Economies, Lifestyles, and Population levels | N/A<br>Jobs, Revenues, etc. | Is in harmony with local and Regional economies & lifestyles in the short term. | Emphasizes mix of commodity and amenity. Maintains lifestyles near present conditions. | Emphasizes commodity outputs and growing economic conditions and possibly populations. | Emphasized recreation and visual while maintaining fairly high commodity outputs. |
| Future Demands for Use of Firewood | MCords | No specific long term plans. | 60,000 cords provided annually. | No special provisions for personal use firewood. All wood sold on competitive basis except slash. | Same as C |
| Provision for Present and future Developed Rec. | MRVD's | Limits the potential. | Increases the potential. | Significantly increases the potential. | Significantly increases the potential. |
| Expanding Demands for Dispersed Recreation | MRVD's | Limits motorized Maintains nonmotorized. | Empahazes and mix of motorized and nonmotorized recreation. | Significantly increases motorized, reduces nonmotorized. | Emphasizes motorized, de-emphasizes nonmotorized. |

| Alt. E (Pref.) | Alt. F | Alt. G | Alt. H |
|---|---|---|---|
| Emphasizes fairly high commodity outputs, primarily timber, in short term with mixed emphasis on commodity and amenity. | Emphasizes mix of commodity and amenity. Maintains lifestyles near present conditions. | Emphasizes amenity values with reduced emphasis on commodity values. | Emphasize amenity values while maintain timber outputs near RPA levels. |
|  | Same as E 60,000 cords annually. | 75,000 cords annually or meet the demand. | Same as G |
| Significantly increase the potential. | Significantly increases the potential. | Limits the potential. | Same as G. |
| Emphasizes a mix of motorized and nonmotorized | Same as E | De-emphasizes motorized with heavy emphasis on nomotorized. | Same as G. |

| Issues and Concerns | Outputs or Effects To Be Measured | Current Direction (A) | RPA (B) | Alt. C | Alt. D |
|---|---|---|---|---|---|
| Goods and Services Provided While Maintaining Visual Quality | Acres | Heavy emphasis on visual. | Moderate emphasis on visual. | Heavy emphasis on goods and services - little emphasis on visuals. | High emphasis on both visual and goods and services. |
| Wildlife Population Levels | Herd Size & Pairs | Maintain current levels. | Increases deer and eagles. Maintains others near current. | Maximizes deer - all others at minimum levels. | Maintains deer. Increases most others. |
| Resources Planning Act Targets | MRVD's<br>MMCF<br>MMUM's<br>Ac Equiv. | Below RPA. | Meets RPA | Exceeds RPA. | Exceeds RPA. goals but meets or exceeds others. |

| Alt E (Pref.) | Alt. F | Alt. G | Alt. H |
|---|---|---|---|
| Same as B except visual emphasized in different | Moderate emphasis on visual and goods and services. | High emphasis on visual and low goods and services. | Moderate emphasis on visual and goods and services. |
| Same as F except some species decrease more rapidly. | Increases deer. Maintains osprey. Increase eagles. Decrease some others. | Decreases deer while increase some other species. | Same as G. |
| Below some RPA target but exceeds others. | Below some RPA goals but meets or exceeds others. | Will not meet RPA. | Meets some RPA goals but not others. |

| Issues and Concerns | Outputs or Effects To Be Measured | Current Direction (A) | RPA (B) | Alt. C | Alt. D |
|---|---|---|---|---|---|
| Areas Available for Geothermal Development | Acres by potential. | Does not address Newberry Crater. | Increases opport. Some sensitive areas available. | Maximizes leasing opportunity. | High levels of leasing opportunity. in sensitive areas. |

| Alt. E (Pref.) | Alt. F | Alt. G | Alt. H |
|---|---|---|---|
| Increases opportunity except in certain sensitive areas. | Increase leasing opportunity except in sensitivity areas. | Limits leasing opportunity to nonsensitive areas only. | Same as G. |

## 2. Resource Outputs, Effects, and Environmental Consequences

The implementation of any one of the alternatives will result in the production of certain outputs and effects and their associated environmental consequences. Some of the consequences are direct while others are indirect. Some of the consequences are short term while others are cummulative or long term. Chapter II of the DEIS presents a detailed description of the resource outputs and effects for each alternative. Chapter IV of the DEIS describes the associated environmental consequences. Much of the analysis performed to develop these outputs, effects, and consequences is quite complex and is described in previous Chapters of this Appendix. Therefore, in order to fully understand the resource outputs, effects, and environmental consequences associated with each alternative, and their derivation, it is recomended that Appendix B be read along with Chapters II and IV of the DEIS.

Tables B-VIII-2 through B-VIII-5 present the direct, indirect, and cummulative resource outputs and effects associated with each alternative and certain selected benchmarks. By examining Table B-VIII-1 (Comparison of Issue And Concern Resolution by Alternative) in conjunction with these tables, a better understanding of the relationship between issue resolution and the resulting outputs and effects for each alternative can be obtained. At the same time, it is also necessary to associate the anticipated environmental consequences that would result from the production of these outputs and effects.

The most significant environmental consequences are those associated with the manipulation of vegetation. Vegetation management in the form of timber harvesting results in changes in the appearance of the forest; changes in wildlife habitat; the short term creation of dust, smoke, and noise; and soil disturbances. The magnitude of these consequences varies between the alternatives depending on how many acres are harvested.

On areas of the Forest where producing timber is the primary objective, existing old growth and mature tree stands will be converted to new and younger stands. The trees in the long term will be smaller and organized in a more uniform manner. There will be less dead and downed material except in areas where it is specifically provided for. Therefore, as old and mature stands of trees are replaced with younger stands, overall plant and animal diversity shifts from species associated with old growth communities to species associated with younger communities. Also, as existing mature stands are converted to plantations, more forage is available for grazing by domestic livestock and wildlife.

All of the alternatives address the harvesting of lodgepole pine in reaction to the mountain pine beetle epidemic. This will result in large areas of the Forest being harvested over a fairly short period of time. Large harvest units will be visible even in areas where visual quality is important. In the short term, these units will detract from the scenic quality of the area until the new stands begin to fill the harvest created openings, and the stumps and logging residues can no longer be seen. In addition, hiding cover for deer and elk will also be reduced over the short term in these areas. This can be mitigated by providing screens or restricting use of roads.

In the long term, some of the alternatives require the development of roadless areas. This would introduce human activity into areas where little human activity presently occurs. This could disturb some species of wildlife and result in increased recreational use levels in areas adjacent to established Wildernesses. Once an area is developed, its Wilderness values are diminished, if not lost, and future options for including the area in Wilderness are forgone. Roading unroaded areas also reduces the opportunity for unroaded dispersed recreation, but at the same time increases the opportunities to develop other resources such as timber or geothermal energy which, in turn, have the potential to provide economic returns to the federal and local governments.

Ground disturbing activities will displace and compact soils but within acceptable limits as outlined by the standards and guidelines. Some compaction will occur, however, as a result of roads, skid trails, and construction of facilities.

To different extents, the alternatives provide for livestock grazing. The higher the livestock grazing levels, the greater the chances are for competition between livestock and deer and elk. Livestock use can also cause damage to young trees in plantations and result in increased reforestation costs, and some loss of tree growth. Also, vegetation is trampled in small isolated areas where livestock tend to concentrate near water sources or salt. However, livestock use levels in riparian zones are controlled to prevent damage to the vegetation and soils and to protect water quality.

Providing for different levels and types of recreation also affects other resources. Providing for undeveloped recreation reduces the amount of timber that could be harvested and limits other types of development such as geothermal. On the other hand, areas used for developed recreation are unusable by many species of wildlife. Also, managing an area for developed recreation results in concentrations of people which can cause soil compaction and has the potential to degrade water quality.

All of the alternatives have their associated social effects as well as environmental effects. For the most part, the social effects are keyed around lifestyles and expectations of forest users. A broad and diverse public is interested in and uses the Deschutes Forest. The major social concerns are related to visual quality, recreation diversity, personal use firewood, and economics. There is also some concern regarding the development of roadless areas and other specific locations on the Forest. Some of the alternatives would tend to polarize people and communities. This is particularly true of both the high amenity and the high commodity alternatives since they are not well balanced regarding the development and use of the Forest. Alternatives with a commodity emphasis tend to result in fewer provisions for visual quality, recreation opportunity, and personal use firewood. On the other hand, an alternative with a commodity emphasis can result in more jobs and higher revenues. On the other hand, alternatives with an amenity emphasis do more to protect the visual quality on large areas of the forest, but limit the developed recreation opportunities. Jobs and revenues are not emphasized while personal use firewood is abundant. Refer to Appendix H for more details.

Table B-VIII-2 displays the average annual quantifiable resource outputs and effects by alternative. The table is quite comprehensive and will be referred to time and again throughout the remainder of this document. The figures following Table B-VIII-2 help to graphically summarize some of the information in this table which pertains to key issues.

Most of the outputs and effects for each alternative are displayed for the years 1986, 2000, and 2030. These can be interpreted as the average annual outputs for the decadal planning periods they represent. The year 1986 is the first year of the the first decade of the plan (1986-1995). The year 2000 is the mid-point of the second decade (1996-2005), and 2030 is the mid-point of the fifth decade (2026-2035).

These years are displayed for their coverage of both short and long-term outputs and effects.

Note that the output levels for some resources during the first two time periods are similiar across all of the alternatives. This makes it appear as though there are no differences between the alternatives. However, there usually are. The Developed Recreation outputs at the top of the table are a good example for this discussion. The consumption levels across all alternatives during 1986 vary from 1393 MRVD's for Alternative A to 1430 MRVDs for Alternative C, a relatively narrow range. However, there is quite a wide range of differences between these Alternatives in the amount and location of lands managed for recreation purposes. The future projections of recreation use for each alternative are based largely on the projected population levels for the State of Oregon and its resulting effects on demand for recreation use on the Forest. Consequently, the short term differences in the amount of recreation use between the Alternatives are relatively small. The differences become greater over time as the different carrying capacities and recreation emphases between the Alternatives begin to affect the recreation use levels and patterns on the Forest. In essence, many of the consequences resulting from decisions made in the alternatives will not be apparent in the short-term, but will become more noticeable in the longrun outputs and effects. The same is true for the projections of range use and wildlife population changes where response to land use management decisions is often more gradual than abrupt.

TABLE B-VIII-2
AVERAGE ANNUAL QUANTIFIABLE RESOURCE OUTPUTS AND ENVIRONMENTAL EFFECTS BY ALTERNATIVE

| Outputs/Effects | Unit of Measure | Cur.Dir. (A) | RPA (B) | C | D | Preferred (E) | F | G | H |
|---|---|---|---|---|---|---|---|---|---|
| Developed Recreation Use | MRVD's[1] | | | | | | | | |
| 1986 | | 1393 | 1421 | 1430 | 1421 | 1421 | 1421 | 1408 | 1421 |
| 2000 | | 1495 | 1725 | 1811 | 1726 | 1727 | 1725 | 1662 | 1719 |
| 2030 | | 1837 | 2567 | 3493 | 2983 | 2770 | 2638 | 2045 | 2310 |
| Non-Wilderness Dispersed Recreation Use | | | | | | | | | |
| Roaded | MRVD's | | | | | | | | |
| 1986 | | 1402 | 1417 | 1434 | 1417 | 1417 | 1416 | 1430 | 1416 |
| 2000 | | 1576 | 1680 | 1747 | 1697 | 1688 | 1678 | 1616 | 1637 |
| 2030 | | 1572 | 1922 | 2340 | 2154 | 2029 | 1954 | 1687 | 1756 |
| Unroaded | | | | | | | | | |
| 1986 | | 132 | 132 | 81 | 132 | 132 | 132 | 135 | 132 |
| 2000 | | 161 | 151 | 98 | 149 | 161 | 151 | 172 | 161 |
| 2030 | | 293 | 293 | 175 | 226 | 293 | 293 | 356 | 293 |
| Wilderness Use | MRVD's | | | | | | | | |
| 1986 | | 77 | 77 | 77 | 77 | 77 | 77 | 79 | 77 |
| 2000 | | 94 | 94 | 94 | 94 | 94 | 94 | 101 | 94 |
| 2030 | | 171 | 171 | 171 | 171 | 171 | 171 | 212 | 171 |
| Trail Construction/ Reconstruction | Miles | | | | | | | | |
| 1986 | | 5 | 5 | 0 | 10 | 5 | 5 | 10 | 10 |
| 2000 | | 5 | 5 | 0 | 10 | 5 | 5 | 10 | 10 |
| 2030 | | 5 | 5 | 0 | 10 | 5 | 5 | 10 | 10 |
| Developed Site Construction/ Reconstruction | CG Units[2] | | | | | | | | |
| 1986 | | 15 | 13 | 15 | 0 | 13 | 13 | 0 | 0 |
| 2000 | | 25 | 20 | 25 | 0 | 20 | 20 | 0 | 0 |
| 2030 | | 35 | 30 | 35 | 0 | 30 | 30 | 0 | 0 |

[1] Thousands of recreation visitor days. All projection based on growth in demand.

[2] Campground units.

| Outputs/Effects | Unit of Measure | Cur.Dir. (A) | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|---|
| Visual Quality Objectives | | | | | | | | | |
| Preservation | Acres | | | | | | | | |
| 1986 | | 232,389 | 231,727 | 228,101 | 228,587 | 232,137 | 232,810 | 232,538 | 232,538 |
| Retention | Acres | | | | | | | | |
| 1986 | | 222,541 | 160,030 | 28,693 | 111,646 | 126,462 | 162,451 | 240,421 | 233,811 |
| Partial Retention | Acres | | | | | | | | |
| 1986 | | 179,273 | 204,998 | 178,724 | 246,937 | 218,090 | 197,649 | 185,558 | 178,073 |
| Modification/Max.Mod. | Acres | | | | | | | | |
| 1986 | | 986,209 | 1,023,657 | 1,184,894 | 1033206 | 1043722 | 1,027,502 | 961,895 | 975,990 |
| Unroaded Areas Assigned to Roaded Management Prescriptions, But Which Have No Development Activities Planned for The Next 15 Years or until Plan is revised. | Acres | 144,925 | 128,348 | 101,764 | 130,439 | 121,248 | 134,842 | 145,142 | 139,532 |
| Unroaded Areas Assigned to Unroaded Management Prescriptions | Acres | 65,270 | 59,668 | 5,424 | 20,986 | 45,054 | 61,793 | 123,437 | 104,459 |
| Wildlife and Fish Use | M WFUD's[3] | | | | | | | | |
| 1986 | | 22.2 | 22.2 | 22.2 | 22.2 | 22.2 | 22.2 | 22.2 | 22.2 |
| 2000 | | 30.2 | 30.1 | 31.5 | 29.7 | 30.8 | 30.5 | 27.3 | 26.3 |
| 2030 | | 54.3 | 52.2 | 54.7 | 51.6 | 53.5 | 52.9 | 47.1 | 45.4 |
| Management Indicator Species | | | | | | | | | |
| Bald Eagles | Pairs | | | | | | | | |
| 1986 | | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| 2000 | | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| 2030 | | 20 | 45 | 45 | 45 | 45 | 45 | 50 | 45 |
| Northern Spotted Owls | Pairs | | | | | | | | |
| 1986 | | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 2000 | | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 2030 | | 10 | 10 | 10 | 10 | 10 | 10 | 11 | 10 |
| Osprey | Pairs | | | | | | | | |
| 1986 | | 125 | 125 | 125 | 125 | 125 | 125 | 125 | 125 |
| 2000 | | 140 | 125 | 125 | 140 | 125 | 125 | 125 | 140 |
| 2030 | | 180 | 80 | 80 | 150 | 80 | 80 | 180 | 180 |

[3] Thousands of wildlife and fish user days.

| Outputs/Effects | Unit of Measure | Cur.Dir. (A) | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|---|
| Goshawk | Pairs | | | | | | | | |
| 1986 | | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 |
| 2000 | | 150 | 85 | 85 | 70 | 75 | 85 | 95 | 85 |
| 2030 | | 65 | 50 | 60 | 50 | 65 | 65 | 80 | 60 |
| Northern 3-Toed Woodpecker | Pairs | | | | | | | | |
| 1986 | | 2440 | 2440 | 2440 | 2440 | 2440 | 2440 | 2440 | 2440 |
| 2000 | | 2110 | 1020 | 905 | 780 | 1040 | 1020 | 1670 | 1045 |
| 2030 | | 1215 | 1445 | 1270 | 1120 | 1465 | 1440 | 1625 | 1060 |
| Pine Marten | Pairs | | | | | | | | |
| 1986 | | 1550 | 1550 | 1550 | 1550 | 1550 | 1550 | 1550 | 1550 |
| 2000 | | 1350 | 1295 | 1225 | 1070 | 1295 | 1285 | 1470 | 1020 |
| 2030 | | 975 | 1465 | 1220 | 970 | 1360 | 1330 | 1385 | 1035 |
| Mule Deer | Numbers | | | | | | | | |
| 1986 | | 20,300 | 20,300 | 20,300 | 20,300 | 20,300 | 20,300 | 20,300 | 20,300 |
| 2000 | | 20,300 | 23,300 | 23,300 | 23,300 | 23,300 | 23,300 | 16,700 | 15,200 |
| 2030 | | 20,300 | 29,800 | 27,100 | 32,300 | 28,600 | 25,900 | 16,700 | 13,300 |
| Elk | Numbers | 1500 for all Alternatives. The Deschutes is primarily summer range for elk. Winter habitat, which is limiting to population size is not present. | | | | | | | |
| Woodpeckers | % of Potential Population | 60% | 60% | 60% | 20% | 60% | 40% | 80% | 80% |
| Resident Trout | See Explanation | Limited data available on fish habitat. Habitat conditions generally good. Standards and Guidelines developed to continue to protect fish habitat. | | | | | | | |
| Wolverine and Peregrine Falcon | See Explanation | Occasional sightings of these species. Standards and Guidelines developed to address habitat if species are confirmed to be present. | | | | | | | |
| Great Blue Heron | See Explanation | Approximately 100 pairs are present. Rookeries (nest trees) are protected by Standards and Guidelines. | | | | | | | |
| Wildlife Habitat Improv. | Acre Equivalents | | | | | | | | |
| 1986 | | 6.2 | 27.0 | 6.4 | 30.0 | 30.0 | 23.5 | 16.0 | 12.5 |
| 2000 | | 6.2 | 27.0 | 4.4 | 30.0 | 30.0 | 23.5 | 16.0 | 12.5 |
| 2030 | | 6.2 | 27.0 | 2.7 | 30.0 | 30.0 | 23.5 | 16.0 | 12.5 |
| Range--Permitted Grazing | MAUM's[4] | | | | | | | | |
| 1986 | | 29 | 32 | 32 | 45 | 29 | 29 | 26 | 32 |
| 2000 | | 29 | 36 | 36 | 45 | 29 | 29 | 26 | 36 |
| 2030 | | 29 | 45 | 45 | 45 | 29 | 29 | 26 | 45 |

[4] Thousands of animal unit months.

| Outputs/Effects | Unit of Measure | Cur.Dir. (A) | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|---|
| Timber Offered: | Million BF[5] | | | | | | | | |
| Regulated | | | | | | | | | |
| 1986 | | 190 | 174 | 265 | 171 | 202 | 174 | 153 | 187 |
| 2000 | | 165 | 203 | 263 | 200 | 209 | 178 | 154 | 177 |
| 2030 | | 230 | 225 | 247 | 225 | 228 | 216 | 181 | 197 |
| Unregulated | | | | | | | | | |
| 1986 | | 15 | 22 | 25 | 22 | 23 | 21 | 20 | 25 |
| 2000 | | 19 | 19 | 21 | 19 | 20 | 19 | 19 | 24 |
| 2030 | | 16 | 21 | 22 | 22 | 22 | 20 | 20 | 28 |
| Total | | | | | | | | | |
| 1986 | | 205 | 196 | 290 | 193 | 225 | 195 | 173 | 212 |
| 2000 | | 184 | 222 | 284 | 219 | 229 | 197 | 173 | 201 |
| 2030 | | 246 | 246 | 269 | 247 | 250 | 236 | 201 | 225 |
| Timber Offered: | Million CF[6] | | | | | | | | |
| Regulated | | | | | | | | | |
| 1986 | | 39.6 | 42.0 | 59.8 | 41.3 | 46.6 | 39.2 | 32.5 | 41.7 |
| 2000 | | 40.7 | 42.0 | 53.8 | 41.3 | 44.3 | 39.2 | 32.5 | 40.7 |
| 2030 | | 40.7 | 41.9 | 45.4 | 41.3 | 41.9 | 39.2 | 32.5 | 40.7 |
| Unregulated | | | | | | | | | |
| 1986 | | 3.2 | 4.7 | 5.4 | 4.8 | 5.0 | 4.5 | 4.3 | 5.4 |
| 2000 | | 4.0 | 4.0 | 4.4 | 4.2 | 4.3 | 4.2 | 3.6 | 5.2 |
| 2030 | | 3.5 | 4.5 | 4.7 | 4.7 | 4.8 | 4.3 | 4.3 | 6.3 |
| Total | | | | | | | | | |
| 1986 | | 42.8 | 46.7 | 65.2 | 46.1 | 51.6 | 43.7 | 36.8 | 47.1 |
| 2000 | | 44.7 | 46.0 | 58.2 | 45.5 | 48.6 | 43.4 | 36.1 | 45.9 |
| 2030 | | 44.2 | 46.4 | 50.1 | 46.0 | 46.7 | 43.5 | 36.8 | 47.0 |
| Regulated Timber Offered by Working Group Mix | | | | | | | | | |
| Ponderosa Pine | | | | | | | | | |
| 1986 | | 16.8 | 15.7 | 18.6 | 13.6 | 15.1 | 16.0 | 17.6 | 17.7 |
| 2000 | | 4.9 | 8.7 | 15.7 | 11.4 | 12.8 | 6.0 | 8.7 | 10.7 |
| 2030 | | 16.4 | 22.5 | 17.7 | 20.6 | 21.3 | 17.3 | 15.4 | 20.8 |
| Lodgepole Pine | | | | | | | | | |
| 1986 | | 11.5 | 23.4 | 16.9 | 23.5 | 22.9 | 16.9 | 9.6 | 16.1 |
| 2000 | | 28.3 | 16.3 | 19.1 | 14.8 | 18.4 | 20.4 | 11.3 | 21.5 |
| 2030 | | 0.3 | 0.2 | 0.1 | 0.2 | 0.2 | 0.2 | 0 | 3.7 |
| Mixed Conifer | | | | | | | | | |
| 1986 | | 11.3 | 3.0 | 14.2 | 4.1 | 8.5 | 6.3 | 5.3 | 7.9 |
| 2000 | | 7.4 | 17.1 | 19.0 | 15.1 | 12.4 | 12.8 | 12.5 | 8.5 |
| 2030 | | 23.9 | 17.1 | 17.6 | 16.4 | 17.4 | 20.2 | 16.6 | 15.5 |

[5] Million board feet.
[6] Million cubic feet.

| Outputs/Effects | Unit of Measure | Cur.Dir. (A) | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|---|
| Mountain Hemlock | | | | | | | | | |
| 1986 | | -- | -- | -- | -- | -- | -- | -- | 0 |
| 2000 | | -- | -- | -- | -- | 0.7 | -- | -- | -- |
| 2030 | | -- | 2.1 | 10.0 | 4.1 | 3.0 | 1.5 | 0.5 | 0.8 |
| Personal Use Fuel Wood | M Cords | 60 | 60 | ? | ? | 60 | 60 | 75 | 75 |
| Reforestation | M Acres/yr | | | | | | | | |
| 1986 | | 9.3 | 15.1 | 19.4 | 15.1 | 16.1 | 12.0 | 7.8 | 12.1 |
| 2000 | | 16.5 | 10.2 | 12.3 | 10.1 | 11.3 | 12.8 | 8.6 | 12.2 |
| 2030 | | 8.7 | 10.3 | 10.3 | 9.0 | 10.4 | 9.2 | 7.1 | 9.9 |
| Timber Stand Improvement | M Acres/yr | | | | | | | | |
| 1986 | | 11.2 | 13.4 | 13.3 | 12.2 | 13.0 | 13.3 | 12.4 | 15.5 |
| 2000 | | 7.9 | 7.2 | 10.6 | 8.8 | 9.7 | 6.3 | 6.5 | 14.7 |
| 2030 | | 13.8 | 12.5 | 15.0 | 11.7 | 14.8 | 11.5 | 15.3 | 15.1 |
| Long-Run Sustained Yield | Million CF | 406 | 408 | 454 | 413 | 395 | 392 | 325 | 363 |
| Timber Growth In 2030 | Million CF | 366 | 398 | 535 | 406 | 431 | 390 | 326 | 376 |
| Reforestation Backlog | Acres | | | | | | | | |
| 1986 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2000 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2030 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reforestation Backlog | Dollars | | | | | | | | |
| 1986 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2000 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2030 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Water Yield | M Acre Feet | | | | | | | | |
| 1986 | | 2.2 | 3.1 | 4.2 | 3.1 | 3.9 | 2.6 | 1.7 | 2.6 |
| 2000 | | 3.4 | 2.7 | 2.9 | 2.4 | 2.6 | 2.9 | 2.1 | 2.6 |
| 2030 | | 2.2 | 2.6 | 2.6 | 2.4 | 2.5 | 2.3 | 1.8 | 2.3 |
| Soil | Risk Index | | | | | | | | |
| 1986 | | 9.0 | 14.7 | 20.7 | 14.4 | 15.0 | 12.7 | 10.2 | 13.4 |
| 2000 | | 13.9 | 10.5 | 13.5 | 10.4 | 11.0 | 11.0 | 9.4 | 12.7 |
| 2030 | | 45.2 | 10.6 | 10.4 | 10.7 | 10.5 | 57.1 | 8.6 | 14.1 |

| Outputs/Effects | Unit of Measure | Cur.Dir. (A) | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|---|
| Potential Geothermal Leasing | M Acres | | | | | | | | |
| High Potential | | 85.9 | 91.5 | 126.1 | 105.0 | 100.0 | 80.3 | 52.8 | 62.8 |
| Moderate Potential | | 484.0 | 461.0 | 486.5 | 483.1 | 468.8 | 461.0 | 436.3 | 444.2 |
| Low Potential | | 402.4 | 400.1 | 410.0 | 410.0 | 400.1 | 402.8 | 399.4 | 400.0 |
| Fire Management Effectiveness Index | $/M Protected Acres | | | | | | | | |
| 1986 | | 2881 | 2676 | 2594 | 2717 | 2696 | 2717 | 2764 | 2758 |
| 2000 | | 2910 | 2799 | 2696 | 2764 | 2764 | 2676 | 2943 | 2764 |
| 2030 | | 2820 | 2553 | 2512 | 2594 | 2594 | 2615 | 2758 | 2615 |
| Arterial and Collector Road Construction/ Reconstruction | Miles | | | | | | | | |
| 1986 | | 57 | 53 | 77 | 51 | 60 | 52 | 46 | 54 |
| 2000 | | 45 | 55 | 82 | 55 | 57 | 48 | 38 | 44 |
| 2030 | | 30 | 45 | 62 | 47 | 47 | 39 | 26 | 32 |
| Timber Purchaser Road Construction/ Reconstruction | Miles | | | | | | | | |
| 1986 | | 51 | 46 | 70 | 45 | 53 | 46 | 40 | 49 |
| 2000 | | 40 | 47 | 73 | 47 | 49 | 41 | 32 | 38 |
| 2030 | | 23 | 34 | 53 | 38 | 37 | 31 | 21 | 25 |
| Roads Subject to Highway Safety Act | Miles | | | | | | | | |
| 1986 | | 1450 | 1450 | 1450 | 1450 | 1450 | 1450 | 1450 | 1450 |
| 2000 | | 1470 | 1500 | 1550 | 1501 | 1501 | 1499 | 1490 | 1492 |
| 2030 | | 1533 | 1610 | 1786 | 1655 | 1680 | 1621 | 1535 | 1573 |
| High Clearance Vehicle Only | Miles | | | | | | | | |
| 1986 | | 6250 | 6250 | 6250 | 6250 | 6250 | 6250 | 6250 | 6250 |
| 2000 | | 6232 | 6251 | 6350 | 6256 | 6255 | 6246 | 6210 | 6219 |
| 2030 | | 6292 | 6295 | 6594 | 6271 | 6370 | 6287 | 6191 | 6243 |
| Fuel Treatment | Thousands of Acres | | | | | | | | |
| 1986 | | 16.5 | 29.6 | 34.9 | 27.9 | 28.5 | 26.4 | 20.2 | 25.5 |
| 2000 | | 22.5 | 24.1 | 27.4 | 23.1 | 23.1 | 23.8 | 19.4 | 23.8 |
| 2030 | | 18.0 | 27.6 | 28.9 | 26.6 | 25.9 | 24.4 | 20.7 | 29.0 |

| Outputs/Effects | Unit of Measure | Cur.Dir. (A) | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|---|
| Operational Costs | Million $ | | | | | | | | |
| 1986 | | 8.8 | 9.2 | 10.0 | 9.1 | 9.4 | 9.0 | 8.6 | 9.2 |
| 2000 | | 8.9 | 9.2 | 10.0 | 9.3 | 9.5 | 9.0 | 8.6 | 9.3 |
| 2030 | | 9.2 | 10.2 | 11.0 | 10.4 | 10.4 | 9.9 | 9.0 | 10.1 |
| Capital Investment Costs | Million $ | | | | | | | | |
| 1986 | | 9.0 | 11.2 | 13.5 | 11.0 | 11.2 | 10.1 | 7.5 | 11.2 |
| 2000 | | 10.9 | 10.2 | 11.9 | 9.7 | 10.1 | 9.9 | 7.2 | 12.2 |
| 2030 | | 9.9 | 11.8 | 11.8 | 11.2 | 11.4 | 10.1 | 8.4 | 11.2 |
| Total- National Forest System Allocated | Million $ | | | | | | | | |
| 1986 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2000 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2030 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Appropriated | Million $ | | | | | | | | |
| 1986 | | 17.8 | 20.4 | 23.5 | 20.1 | 20.6 | 19.1 | 16.1 | 20.4 |
| 2000 | | 19.8 | 19.4 | 21.9 | 18.9 | 19.6 | 18.9 | 15.8 | 21.5 |
| 2030 | | 19.0 | 22.0 | 22.8 | 21.6 | 21.8 | 20.1 | 17.4 | 21.4 |
| Returns to Government | Million $ | | | | | | | | |
| 1986 | | 28.8 | 21.6 | 34.9 | 20.6 | 26.0 | 24.2 | 23.8 | 26.3 |
| 2000 | | 17.4 | 30.1 | 40.8 | 30.6 | 30.7 | 23.3 | 23.5 | 23.2 |
| 2030 | | 58.8 | 54.2 | 49.5 | 51.7 | 52.5 | 53.1 | 43.5 | 44.7 |
| Changes in Jobs | Change in Number of MM$ | | | | | | | | |
| 1986 | | na | -258 | 550 | -295 | -21 | -202 | -321 | -84 |
| 2000 | | 738 | 1808 | 2584 | 1981 | 1865 | 1611 | 1249 | 1406 |
| 2030 | | 2834 | 4778 | 7382 | 5934 | 5398 | 4936 | 3021 | 3646 |
| Changes in Income | Change in Total MM$ | | | | | | | | |
| 1986 | | na | -6.4 | 14.0 | -7.3 | - .4 | -5.0 | -8.0 | -2.0 |
| 2000 | | 7.2 | 26.3 | 43.4 | 28.9 | 27.6 | 21.4 | 15.0 | 17.4 |
| 2030 | | 46.6 | 70.9 | 106.8 | 86.4 | 79.3 | 72.4 | 43.7 | 52.5 |
| Payments to Counties | Million $ | | | | | | | | |
| 1986 | | 7.2 | 5.4 | 8.7 | 5.2 | 6.5 | 6.0 | 6.0 | 6.6 |
| 2000 | | 4.3 | 7.5 | 10.2 | 7.7 | 7.7 | 5.8 | 5.9 | 5.8 |
| 2030 | | 14.7 | 13.5 | 12.4 | 12.9 | 13.1 | 13.3 | 10.9 | 11.2 |

| Outputs/Effects | Unit of Measure | Cur.Dir. (A) | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|---|
| Lands Tentatively Suitable for Timber Production | M Acres | 1,148.7 | 1,148 | 1,148.7 | 1,148.7 | 1,148. | 1,148.7.77 | 1,148.7 | 1,148.7 |
| Acres Available for Specific Resource Uses | | | | | | | | | |
| Timber Harvest | M Acres | 1,018.9 | 1,055 | 1,049.6 | 1,047.2 | 1,017. | 1010.2.68 | 823.9 | 949.5 |
| Grazing | M Acres | | | | | | | | |
| Lands Suitable & Appropriate for Regulated/Programmed Timber Harvesting | M Acres | 990.8 | 1,000 | 1,043.6 | 994.0 | 1009.3 | 950.9.4 | 804.1 | 948.9 |
| Lands Suitable & Appropriate for Regulated/Programmed Timber Harvesting by Yield Category | M Acres | | | | | | | | |
| Full Yield | | 898.6 | 919.8 | 1009.4 | 921.3 | 952.1 | 886.6 | 774.2 | 886.1 |
| 50-99% of Full Yield | | 92.2 | 80.6 | 34.2 | 72.7 | 57.2 | 64.3 | 29.9 | 62.8 |
| 1-49% of Full Yield | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Tentatively Scheduled Timber Harvest | M Acres | | | | | | | | |
| 1986 | | | | | | | | | |
| Clearcut | | 5.2 | 4.3 | 7.6 | 4.2 | 5.5 | 4.1 | 2.9 | 4.4 |
| Shelterwood | | 4.1 | 10.8 | 11.7 | 11.0 | 10.5 | 7.9 | 4.7 | 7.6 |
| Selection | | .0 | .1 | .1 | .1 | .1 | .1 | .1 | .1 |
| Overstory Removal | | 4.0 | 5.5 | 5.4 | 4.4 | 5.3 | 5.6 | 6.7 | 5.8 |
| Commercial Thin | | 3.2 | 3.9 | 4.4 | 3.8 | 4.1 | 3.7 | 2.8 | 5.2 |
| TOTAL | | 16.5 | 24.6 | 29.2 | 23.5 | 25.5 | 21.4 | 17.2 | 23.1 |
| 2000 | | | | | | | | | |
| Regen Harvest/Overstory Removal | | 17.3 | 13.8 | 17.3 | 13.8 | 15.3 | 14.2 | 11.9 | 15.9 |
| Commercial Thin | | 5.2 | 4.7 | 4.4 | 4.7 | 4.5 | 4.5 | 4.5 | 5.5 |
| TOTAL | | 22.5 | 18.5 | 21.7 | 18.5 | 19.8 | 18.7 | 16.4 | 21.4 |
| 2030 | | | | | | | | | |
| Regen Harvest/Overstory Removal | | 9.8 | 11.6 | 11.6 | 10.6 | 11.1 | 10.3 | 8.2 | 10.7 |
| Commercial Thin | | 8.2 | 10.8 | 11.6 | 11.4 | 11.8 | 9.0 | 9.5 | 15.9 |
| TOTAL | | 18.0 | 22.4 | 23.2 | 22.0 | 22.9 | 19.3 | 17.7 | 26.6 |
| Wild and Scenic Rivers: | | | | | | | | | |
| Wild (W) | Miles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Scenic (S) | Miles | 0 | 0 | 0 | 0 | 0 | 0 | 17 | 17 |
| Recreation (R) | Miles | 0 | 65 | 0 | 180 | 29 | 11 | 204 | 204 |

Many of the outputs and effects that would result from the implementation of an alternative can not be easily expressed in quantitative terms. For these cases, qualitative statements are necessary to summarize the respective consequences of each alternative. Table B-VIII-3 presents a tabular comparison of the qualitative outputs and effects associated with each of the Alternatives.

TABLE VIII-3
QUALITATIVE RESOURCE OUTPUTS AND ENVIRONMENTAL EFFECTS

| Resource Outputs and Environmental Effects | Cur. Dir. (A) | RPA B | C | D | Preferred E | F | G | H |
|---|---|---|---|---|---|---|---|---|
| Air Quality | Temporary and localized reductions in quality due to dust from roads and smoke from burning. | Slight increase in dust and smoke but temporary and localized. | Increase in dust and smoke which could be more continuous and affect more area. | Temporary and localized dust and smoke. | Some increase in dust and smoke but temporary and mostly localized. | Temporary and localized dust and smoke. | Some decrease in dust and smoke. | Temporary and localized dust from roads and smoke. |
| Visual Character of Forest | Subtle changes would occur in areas commonly seen by people. Exception would be areas being treated because of pine beetle epidemic. | Changes would not be apparent in areas commonly seen except where pine beetle areas pine beetle areas are being treated. | The Forest would not appear natural and human activities would be apparent. | Areas seen by people would change gradually. Rest of Forest would change rapidly. | Most areas seen by people would appear natural, except areas being treated because of pine beetles. | Much of the Forest would appear natural except areas being treated because of pine beetles. | Much of the Forest would appear natural. Changes would be gradual. | Most of the west side of the Forest would appear natural while the east side would show human activities. |
| Changes in Recreational Use Patterns | Wide variety of recreation opportunity available. | Wide variety of recreation opportunity. available. | Opportunity oriented at developed and motorized. | Opportunity oriented at day use and motorized. | Wide variety of opportunity available. | Wide variety of opportunity available. | Opportunity oriented at undeveloped and non-motorized. | Opportunity oriented at undeveloped and non-motorized. |
| Social Effects:<br>a. Community Cohesion | Few problems but conflicts arise. | Could result in polarization. | Would polarize some communities. | Some polarization would occur. | Conflicts should be localized. Cohesion would not be affected. | Conflicts should be localized. Cohesion would not be affected. | Could cause polarization. | Could cause some polarization. |
| b. Lifestyles | Provides for lifestyles but with increasing restrictions. | Provides for lifestyles but with increased regulation. | Increases jobs but restricts use of the Forest for recreation and firewood gathering. | Increases jobs some. Narrows the recreation opportunity. | Maintains jobs and provides for broad recreation opportunity. | Reduces jobs but maintains range of recreation opportunity. | Reduces jobs and limits recreation opportunity. | Reduces jobs some and limits recreation opportunities. |

| Resource Outputs and Environmental Effects | Cur. Dir. (A) | RDA B | C | D | Perf. E | F | G | H |
|---|---|---|---|---|---|---|---|---|
| c. Expectations about change. | Does not result in rapid change. | Some change but not dramatically different than current direction. | Change would be viewed as dramatic. | Significant change would occur compared to current direction. | Some change would occur but not dramatically different than current direction. | Change would not be dramatic based on current direction. | Little change would occur. | Little change on west side of Forest with considerable change on east side. |
| Mountain Pine Beetle<br>a. Losses | Much lodgepole would be destroyed since some areas would not be treated. | Some lodgepole would be lost and not treated. | Little lodgepole would be lost. | Little lodgepole would be lost. | Some lodgepole would be lost. | Some lodgepole would be lost. | Much lodgepole would be lost. | Much lodgepole would be lost. |
| b. Future Risk of Epidemic | Could repeat in the future. | Risk is minimized. | Risk would be minimal. | Risk would be minimal. | Risk would be minimal. | Risk would be minimal. | Risk would be high in many areas. | Risk would be high in some areas. |
| c. Wood and Forage Production | Would not be increased to its full potential. | Some increase would occur. | High production levels would occur. | High production levels would occur. | Some increase would occur. | Some increase would occur. | Slight increase would occur. | Some increase would occur. |
| Wildlife in General | Habitat provided by mature lodgepole pine would be reduced gradually. | Habitat provided by mature lodgepole pine would be reduced fairly rapidly. | Habitat provided by mature lodgepole pine and other mature stands would be reduced rapidly. | Habitat provided by mature lodgepole pine and other mature stands would be reduced rapidly. | Habitat provided by mature lodgpeole pine would be reduced fairly rapidly. | Habitat provided by mature lodgepole pine would be reduced fairly rapidly. | Much habitat provided by mature lodgepole will become dead stands. | |
| American Indians | Is compatible with Warm Springs Reservations Comprehensive Plan. | Is compatible with Warm Springs Reservation Comprehensive Plan. | Is not compatible with Warm Springs Reservation Comprehensive Plan. | Is not compatible with Warm Springs Reservation Comprehensive Plan. | Is compatible with Warm Springs Reservation Comprehensive Plan. | Is compatible with Warm Springs Reservation Comprehensive Plan. | Is compatible with Warm Springs Reservation Comprehensive Plan. | Is compatible with Warm Springs Reservation Comprehensive Plan. |

While evaluating the outputs and effects of the alternatives and assessing their ability to address the Planning ICO's, it is sometimes useful to know how the output levels of a particular alternative compare with the total potential of the Forest to produce those outputs. Table B-VIII-4 presents the output levels of certain key resources for each alternative and selected benchmarks, and compares them to the capabilities of the Forest to produce those outputs. The rows in the table display the benchmarks and alternatives while the columns represent various outputs and effects which vary significantly across the Alternatives. Two numbers are displayed for each row and column intersection in the table. The top number is the production level associated with a particular alternative (row) and output (column). The bottom number is the percent of the potential capability represented by the Alternative's output level.

For example, the maximum PNV benchmark has a present net value of $1501.51 million (row 1 and column 1). Since this benchmark was developed to estimate the maximum present net value of the priced resources (timber, range, and recreation) on the Forest, its present net value represents 100 percent of the potential capability. The seventh row of the same column displays the present net value of Alternative C at $1285.81 million, or 86 percent of the potential capability.

The remainder of the table may be interpreted in a similar manner. The total potential capability of each of the outputs and effects displayed in the various columns was determined during the Analysis of the Management Situation (AMS). More detail regarding this analysis step is available in the AMS summary of the Forest Plan, the AMS document, previous Chapters in this Appendix, and process records.

### Table VII-4 Comparison of Outputs and Per[illegible] of Potential Capability

|  | Million $ Present Net Value | Timber1/ Harvest MMCF | Pairs Eagle 2/ Population | M Deer 2/ Population | Pairs Osprey 2/ Population | M Acres 3/ Retention & Partial Retention | 2 Dispersed Recreation MRVD's/Yr. | 2 Developed Recreation MRVD's/Yr. | 2 Range MAUM's |
|---|---|---|---|---|---|---|---|---|---|
| Maximum PNV (BM-4) | 1501.51<br>100% | 939<br>181% | 45<br>90% | -- | -- | -- | 2622<br>100% | 3666<br>100% | 29<br>64% |
| Maximum PNV (BM-7) | 1420.08<br>95% | 506<br>98% | 45<br>90% | -- | -- | -- | 2622<br>100% | 3666<br>100% | 29<br>64% |
| Maximum Timber | -- | 518<br>100% | 45<br>90% | -- | -- | -- | 1461<br>56% | 1119<br>31% | 29<br>64% |
| Maximum Recreation | -- | 403<br>78% | 45<br>90% | 30.5<br>91% | -- | 277.9<br>35% | 2622<br>100% | 3666<br>100% | 24<br>53% |
| Maximum Wildlife | -- | 451<br>87% | 50<br>100% | 33.5<br>100% | 180<br>100% | 31.8<br>4% | 1461<br>56% | 1119<br>31% | 16<br>36% |
| Maximum Visual | -- | 455<br>88% | 45<br>90% | -- | -- | 484.3<br>100% | 1461<br>56% | 1119<br>31% | 24<br>53% |
| Alternative C | 1285.81<br>86% | 598<br>115% | 45<br>90% | 32.3<br>96% | 80<br>44% | 207.4<br>43% | 2686<br>102% | 3493<br>95% | 45<br>100% |
| Alternative F | 1125.21<br>75% | 392<br>76% | 45<br>90% | 28.6<br>85% | 80<br>44% | 360.1<br>74% | 2418<br>92% | 2638<br>72% | 29<br>64% |
| Alternative B (RPA) | 1124.13<br>75% | 420<br>81% | 45<br>90% | 27.1<br>81% | 80<br>44% | 365.0<br>75% | 2386<br>91% | 2567<br>70% | 45<br>100% |
| Alternative E (Preferred) | 1123.41<br>75% | 466<br>90% | 45<br>90% | 29.8<br>89% | 80<br>44% | 344.6<br>71% | 2493<br>95% | 2770<br>76% | 45<br>100% |
| Alternative D | 1121.25<br>75% | 413<br>80% | 45<br>90% | 25.9<br>77% | 150<br>83% | 358.6<br>74% | 2551<br>97% | 2983<br>81% | 29<br>64% |
| Alternative H | 1027.24<br>68% | 417<br>81% | 45<br>90% | 13.3<br>40% | 180<br>100% | 411.9<br>85% | 2220<br>85% | 2310<br>63% | 45<br>100% |
| Alternative A (Current Direction) | 741.32<br>49% | 396<br>76% | 20<br>40% | 27.5<br>82% | 180<br>100% | 401.8<br>83% | 2036<br>78% | 1837<br>50% | 29<br>64% |
| Alternative G | 661.27<br>44% | 325<br>63% | 50<br>100% | 16.7<br>50% | 180<br>100% | 426.0<br>88% | 2255<br>86% | 2045<br>56% | 26<br>58% |

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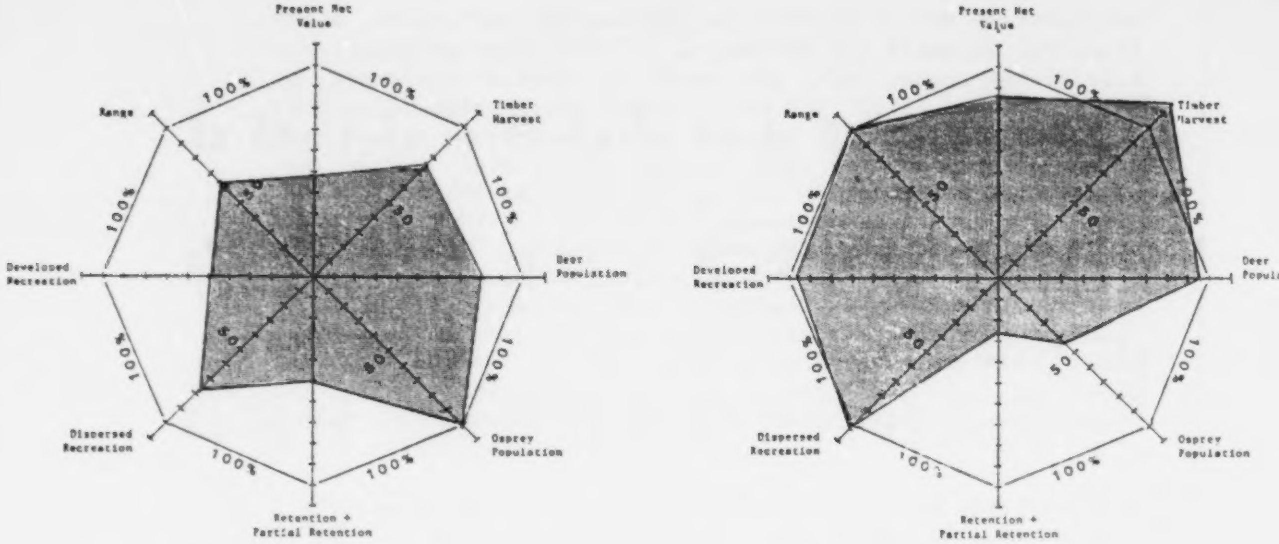
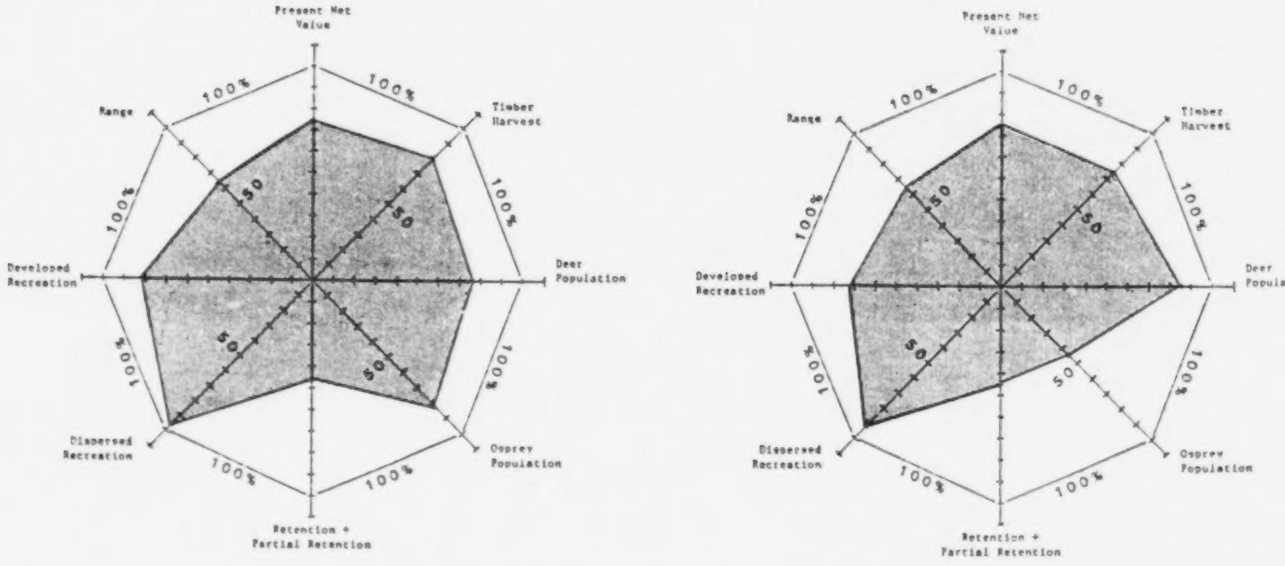
1/ First Decade - Does not include unregulated.
2/ Fifth Decade
3/ First Decade



Current Direction

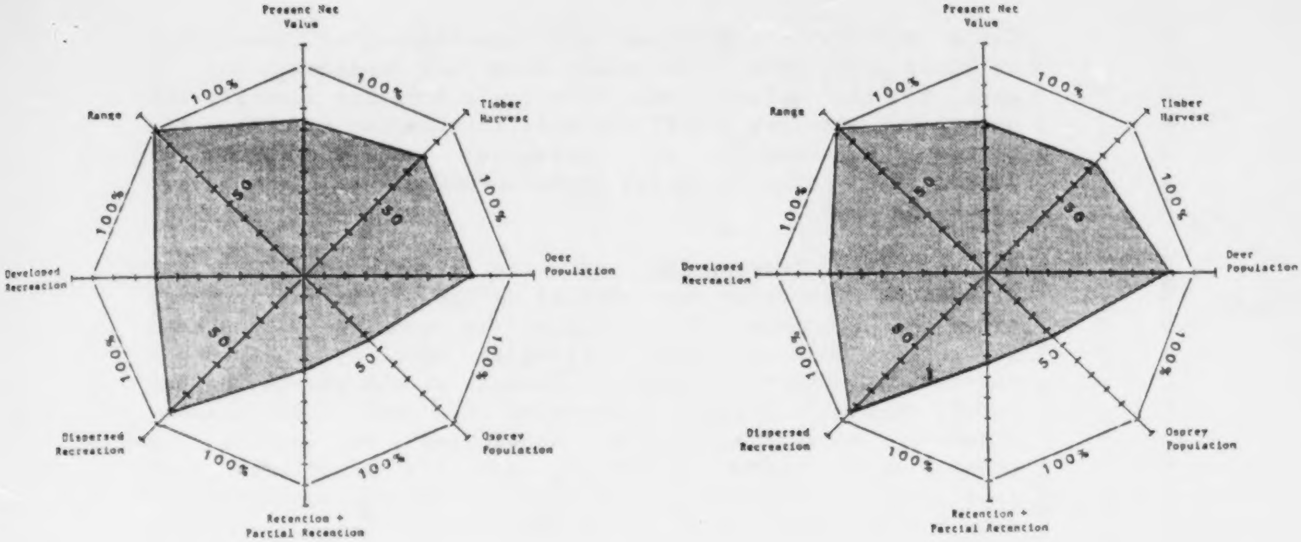
Alternative A



Alternative B

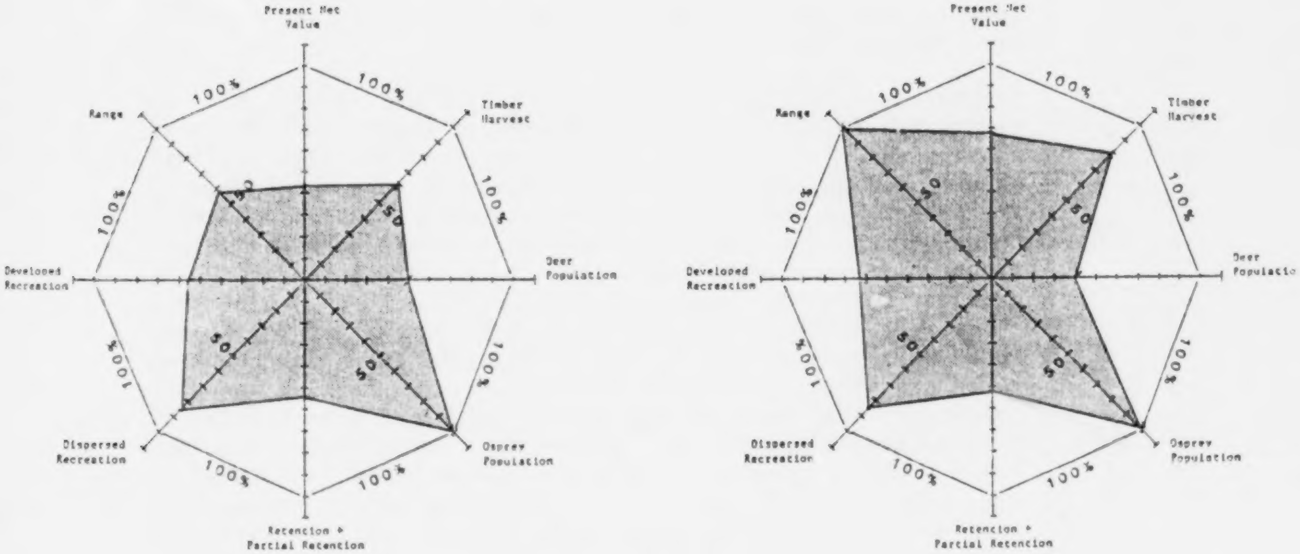
Alternative C

**Figure I**



Alternative E

Alternative F



Alterntive G

Alternative H

**Figure II**

Table B-VIII-5 summarizes the development of inventoried roadless areas that would result from the implementation of each of the alternatives. This table does not identify the individual roadless areas. For more information regarding the planned development of individual roadless areas by alternative, refer to Tables IV-4a through IV-4k in Chapter IV of the DEIS.

During the development of the Alternatives, various management strategies were applied to the different roadless areas. A schedule of activities is coupled with these strategies. Some of these strategies such as undeveloped recreation, Research Natural Areas, or old growth, do not permit regulated timber harvesting or road construction. However, other management strategies do involve the scheduling of timber harvesting and its associated road construction activities (i.e., general forest, scenic views, deer winter range, etc.). It is the consequences of applying these management strategies to the roadless areas which are displayed in Table B-VIII-5 and the respective individual roadless area tables in Chapter IV.

Where timber production is part of the strategies applied to a roadless area, the schedule of harvesting was developed with FORPLAN. Upon examining Table B-VIII-5, it is apparent that the model did not schedule timber harvesting or road construction during the first decade in any alternative for any roadless area.

However, in certain situations there may need to be exceptions to the planned development of these roadless areas as displayed in the table. Many of the roadless areas contain mature and overmature stands of lodgepole pine which is dead and dying as a result of the mountain pine beetle epidemic. Consequently, it may be necessary to enter portions of the areas to salvage this material, reduce fuel hazards, or provide firewood. Since it is difficult to model this catastrophic situation, the schedule of timber harvesting and road construction activities displayed for these roadless areas may need to be adjusted to reflect the rapidly changing conditions that exist in the mature lodgepole pine stands. In Alternatives G and H, no unscheduled entry into roadless areas would be permitted and the epidemic would be allowed to run its natural course. In Alternatives A through F, unscheduled entries may need to be made in order to treat the lodgepole situation. This is most likely to occur in the North and South Paulina and Bearwallows roadless areas since they are already heavily infested with the mountain pine beetle and are predominately lodgepole pine.

Table B-VIII-5 Summary of Roadless Area Development by Alternative

| | Cur.Dir. Alt. A | RPA Alt. B | Alt. C | Alt. D | Preferred Alt. E | Alt. F | Alt. G | Alt. H |
|---|---|---|---|---|---|---|---|---|
| Total Unroaded Acres | 145,142 | 145,142 | 145,142 | 145,142 | 145,142 | 145,142 | 145,142 | 145,142 |
| Acres Available for Development | 79,872 | 85,474 | 139,718 | 124,156 | 100,088 | 83,349 | 21,705 | 40,683 |
| Acres Unavailable for Development 1 | 65,270 | 59,668 | 5,424 | 20,986 | 45,054 | 61,793 | 123,437 | 104,459 |
| Acres Available for Winter Recreation/Geothermal 2 | 0 | 14,202 | 23,269 | 8,992 | 18,262 | 5,589 | 0 | 4,469 |
| Acres of Timber Harvest: 3 | | | | | | | | |
| Decade 1 | ------------------Depends on Mountain Pine Beetle Epidemic------------ | | | | | | 0 | 0 |
| Decade 2 | 217 | 2,592 | 20,109 | 5,711 | 5,632 | 4,711 | 0 | 1,141 |
| Decade 3 | 7,988 | 0 | 143 | 0 | 9,898 | 82 | 0 | 4,192 |
| Decade 4 | 1,184 | 639 | 17,799 | 1,353 | 4,702 | 1,778 | 640 | 2,007 |
| Decade 5 | 3,131 | 10,363 | 29,958 | 15,868 | 14,719 | 9,453 | 1,981 | 4,507 |
| Cumulative Miles of Road Construction by: 4 | | | | | | | | |
| Decade 1 | --------------Depends on Mountain Pine Beetle Epidemic-------------- | | | | | | 0.0 | 0.0 |
| Decade 2 | 2.2 | 25.9 | 200.1 | 57.1 | 56.3 | 47.1 | 0.0 | 11.4 |
| Decade 5 | 125.2 | 135.9 | 680.1 | 229.3 | 349.5 | 160.2 | 26.2 | 118.5 |
| Acres Remaining Undeveloped After: 5 | | | | | | | | |
| Decade 1 | 145,142 | 145,142 | 145,142 | 145,142 | 145,142 | 145,142 | 145,142 | 145,142 |
| Decade 2 | 144,925 | 142,550 | 125,033 | 139,431 | 139,510 | 140,431 | 145,142 | 144,001 |
| Decade 5 | 132,622 | 131,548 | 77,133 | 122,210 | 110,191 | 129,118 | 142,142 | 133,295 |

1 Includes management strategies which primarily exclude roading such as Research Natural Areas, some forms of undeveloped recreation, and the Bend Municipal Watershed.

2 The acres assigned to the winter recreation and geothermal strategy are available for roading but it is difficult to predict when that would occur since it is dependent upon leasing and exploration. Some exploration could be expected in the first decade but it is impossible to say how much and where.

3 The acres scheduled for timber harvest would also have associated roads so that total acres impacted would be somewhat higher than shown above.

4 Based on a coefficient of .01 miles of collector and local roads per acre harvested. The unpredictable impacts of geothermal exploration and development are not included.

5 Includes only the impacts of scheduled timber harvesting. Does not consider geothermal exploration or some development that might occur because of the mountain pine beetle epidemic in lodgepole pine.

## 3. Comparison of the Economic and Social Effects of the Alternatives

This section compares and discusses the economic consequences of the alternatives. The section will begin with a general discussion of PNV and the factors which influence it between the alternatives. The section will then cover the implications of the alternatives with regards to budget, returns to the U.S. Treasury, noncash benefits, and economic impacts on the local communities. Finally, the significant incremental changes in PNV from one alternative to another will be summarized. The focus of this discussion will be on the tradeoffs between priced and nonpriced outputs and their effects on the overall ability of the alternatives to address certain key issues, concerns, and opportunities.

### a. PNV, Discounted Costs and Benefits, and Their General Relationships to Both Priced and Nonpriced Outputs

Present net value (PNV) is the primary quantitative measure of economic efficiency for each benchmark and alternative. PNV is the sum of market and nonmarket priced values less all management costs for the 50 year planning horizon discounted to present values at a 4 percent interest rate.

The PNV's of the two Max-PNV Benchmarks (BM-4 and BM-7) and the eight proposed management alternatives are displayed in Table B-VIII-6. The alternatives are ranked in order of decreasing PNV. Table VIII-6 shows the differences in PNV between adjacent pairs of the successionally ranked alternatives. These figures are estimates of the net economic values of the priced resources that would be foregone if a lower-ranked alternative is selected over the preceding one. These relationships are graphically displayed in Figure III.

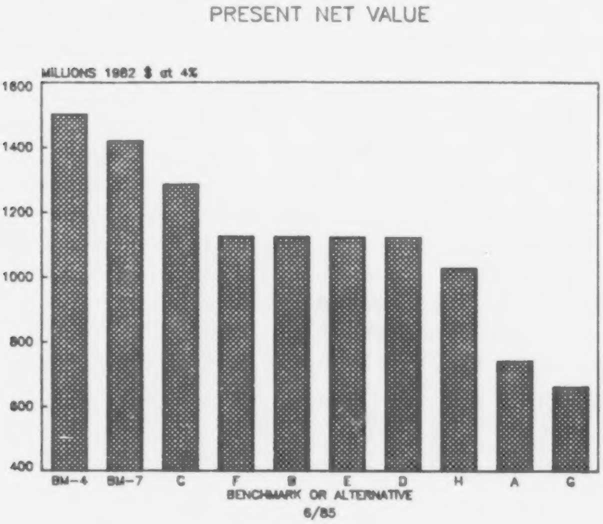


Figure III

Table B-VIII-6 Present Net Value, Discounted Costs, Discounted Benefits, and Benefit/Costs Ratios (Millions 1982$ @4%)

| | Present Net Value | | Present Value of Costs | | Present Value of Benefits | | Benefit/Cost Ratio |
|---|---|---|---|---|---|---|---|
| | PNV | Difference in PNV | Costs | Difference in Costs | Benefits | Difference in Benefits | |
| Benchmarks: | | | | | | | |
| Max. PNV (Run-4) | 1501.51 | N.A. | 516.83 | N.A. | 2018.33 | N.A. | 3.91 |
| Max. PNV with CMAI and NDY (Run-7) | 1420.08 | -81.43 | 434.17 | -82.66 | 1854.25 | -164.08 | 4.27 |
| Alternatives: (Ranked by Decreasing PNV) | | | | | | | |
| Alternative C | 1285.81 | -134.27 | 489.11 | +54.94 | 1774.92 | -79.33 | 3.63 |
| Alternative F | 1125.21 | -160.60 | 416.66 | -72.45 | 1541.87 | -233.05 | 3.70 |
| Alternative B (RPA) | 1124.13 | -1.08 | 439.53 | +22.87 | 1563.66 | +21.79 | 3.56 |
| Alternative E (Preferred) | 1123.41 | -0.72 | 441.05 | +1.52 | 1564.46 | +0.80 | 3.55 |
| Alternative D | 1121.25 | -2.16 | 431.11 | -9.94 | 1552.36 | -12.10 | 3.60 |
| Alternative H | 1027.24 | -94.01 | 446.58 | +15.47 | 1473.82 | -78.54 | 3.30 |
| Alternative A (Current Direction) | 741.32 | -285.92 | 407.60 | -38.98 | 1148.92 | -324.90 | 2.82 |
| Alternative G | 661.27 | -80.05 | 363.83 | -43.77 | 1025.10 | -123.82 | 2.82 |

Before comparing the PNV's, it is first necessary to discuss some of the components of the PNV calculations in order to get a better understanding of the true differences between the alternatives. Displayed in Table B-VIII-6 are the present values of the costs and benefits associated with each of the alternatives. Table B-VIII-7 presents a more detailed breakdown of the benefits and costs by major resource categories. The PNV for each alternative is the difference between discounted costs and discounted benefits. Figure IV displays these relationships for each of the alternatives ranked in order of decreasing PNV from left to right.

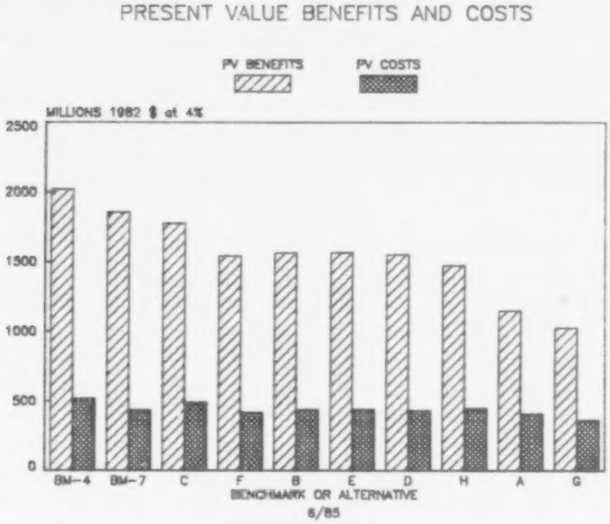


Figure IV

Table B-VIII-7 Discounted Benefits and Costs by Resource Groups (Millions 1982$ @4%)1

| | | Discounted Priced Benefits by Resource | | | | | | Discounted Costs by Major Categories | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PNV | Timber | Wilderness Rec. | Disp. Rec. | Dev. Rec. | Range | Spec. Use Permits | Timber | Rec. & Wildlife | Range | Roads | Other (Admin.& Support) |
| Benchmarks: | | | | | | | | | | | | |
| Max. PNV (Run-4) | 1501.51 | 1217.72 | 43.50 | 346.16 | 383.92 | 6.77 | 20.25 | 194.32 | 46.12 | 2.52 | 69.73 | 204.13 |
| Max. PNV with CMAI and NDY (Run-7) | 1420.08 | 1053.64 | 43.50 | 346.16 | 383.92 | 6.77 | 20.25 | 144.72 | 45.45 | 2.52 | 64.64 | 176.84 |
| Alternatives: (Ranked by Decreasing PNV) | | | | | | | | | | | | |
| Alternative C | 1285.81 | 985.70 | 39.13 | 343.76 | 375.57 | 10.51 | 20.25 | 180.90 | 47.65 | 3.90 | 65.40 | 191.26 |
| Alternative F | 1125.21 | 786.13 | 39.13 | 345.11 | 345.68 | 6.77 | 19.04 | 144.85 | 44.40 | 2.52 | 53.41 | 171.47 |
| Alternative B (RPA) | 1124.13 | 809.17 | 39.13 | 344.38 | 343.56 | 8.43 | 18.99 | 157.30 | 44.33 | 3.14 | 57.85 | 176.91 |
| Alternative E (Preferred) | 1123.41 | 802.63 | 39.13 | 347.40 | 347.78 | 8.43 | 19.09 | 155.23 | 45.04 | 3.14 | 57.17 | 180.47 |
| Alternative D | 1121.25 | 791.29 | 39.13 | 345.54 | 350.46 | 6.77 | 19.17 | 153.04 | 44.70 | 2.52 | 55.77 | 175.07 |
| Alternative H | 1027.24 | 739.25 | 39.13 | 334.51 | 333.73 | 8.43 | 18.76 | 169.65 | 42.44 | 3.14 | 52.34 | 179.01 |
| Alternative A (Cur.Direction) | 741.32 | 781.53 | 20.75 | 168.97 | 153.27 | 6.77 | 17.63 | 148.56 | 34.55 | 2.52 | 50.80 | 171.16 |
| Alternative G | 661.27 | 635.05 | 23.07 | 175.68 | 167.30 | 6.07 | 17.93 | 111.91 | 37.12 | 2.29 | 56.32 | 156.20 |

1 Direct comparisons of benefits and costs by individual resource provide broad indications of specific relationships, but they ma be misleading because many costs are nonseparable under multiple-use management.

The discounted costs is the sum of all Deschutes National Forest expenditures for 50 years, discounted to their present value using a 4 percent interest rate. The maximum discounted costs for management of the Forest is $516.8 million for BM-4 while the minimum is $363.8 million for Alternative G. As shown in Table II-5a, the difference in discounted costs between alternatives is primarily accounted for in the amount of funding necessary for timber management and organizational support in order to implement the alternatives.

The "discounted benefits" for each alternative is the sum of the present values of all market and nonmarket priced benefits over the 50 year planning horizon. As shown in Figure IV, BM-4 provides the largest amount of discounted priced benefits ($2018.3 million). Of the alternatives, Alternative C produces the most discounted priced benefits at $1774.9 million while Altenative G results in the fewest ($1025.1 million). The differences between the alternatives can be attributed primarily to the timber related benefits and secondarily to recreation. Figure V helps to show this. It presents the discounted benefits for each alternative broken down by market and nonmarket related outputs. The market related benefits are mostly accounted for by timber outputs. The nonmarket benefits are primarily related to recreation. It shows that the market related benefits are the ones that vary the most from the high to the low end of the range in PNV's between alternatives. However, the nonmarket values for Alternative A (Current Direction) and Alternative G are distinctly lower than the nonmarket benefits for the other alternatives. These differences will be explained in more detail below.

It is important to note that none of the economic consequences displayed in this Chapter, whether they be present net values, returns to the government, or impacts on jobs and income in the local economy, include those associated with the possible future development of geothermal resources on the Deschutes National Forest. Substantial geothermal resources are believed to exist on the Forest, but the timing of their development and the extent of their potentials is highly speculative. The potential economic consequences that could result from the development of geothermal are believed to be significant and could vary amongst the alternatives. For more information regarding the geothermal resources on the Forest and their possible economic consequences, refer to Chapters III and IV of the DEIS.

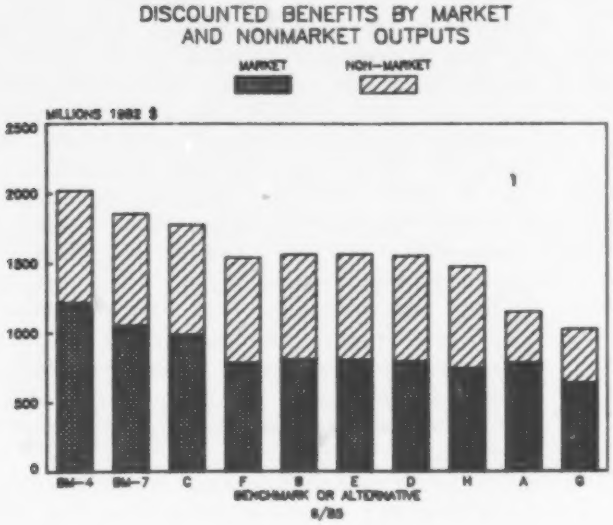


Figure V

"Noncash benefits" is yet another aspect of discounted benefits which needs to be discussed. Noncash benefits refer to the benefits individual resource users receive who are charged less for the resource than they are willing to pay, or current market prices indicate they should pay. They are the difference between the full economic value of the resource and the fees actually paid to use that resource. Noncash benefits are measured by the difference between total discounted benefits less the discounted receipts that are generated by each alternative. The Forest receives revenues for stumpage, grazing permits, campground fees, and other special use permits. Yet, the Forest generates benefits to users which are not realized in terms of cash flows. This is because dollar prices are assigned to nonmarket resources on the Forest in order to reflect their full economic value even though none or only part of that value is collected as fees under current laws and policies. Timber is the only resource for which the discounted benefits are equivalent to discounted revenues. For all of the other resources, recreation being the primary one, discounted benefits exceed revenues. Figure VI displays the relationships between total discounted benefits, receipts, and noncash benefits for each alternative in order of decreasing PNV. The size of the noncash benefit is directly related to the amount of recreation (primarily) and range (secondarily) benefits generated by each alternative.

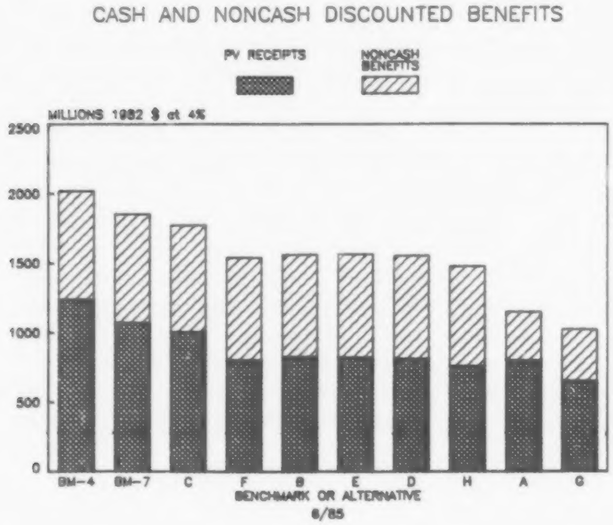


Figure VI

Comparisons of economic benefits to costs can provide measures of the overall economic efficiency of the alternatives. Both present net value and benefit/cost ratios are measures of economic efficiency. However, and as evident from comparing the present net values and benefit/cost ratios presented in Table B-VIII-6, they can produce different rankings of efficiency among the alternatives. Present net value represents the magnitude of difference between discounted benefits and discounted costs, and tends to be higher for alternatives with larger budgets and resource output levels. On the other hand, benefit/cost ratios are derived by dividing the discounted benefits by discounted costs. Benefit/cost ratios better reflect the efficiency with which dollars of expenditures are used to generate benefits, and have little to do with the magnitude of resource output levels. The benefit/cost ratios for each of the alternatives in order of decreasing PNV from left to right are also displayed in Figure VII.

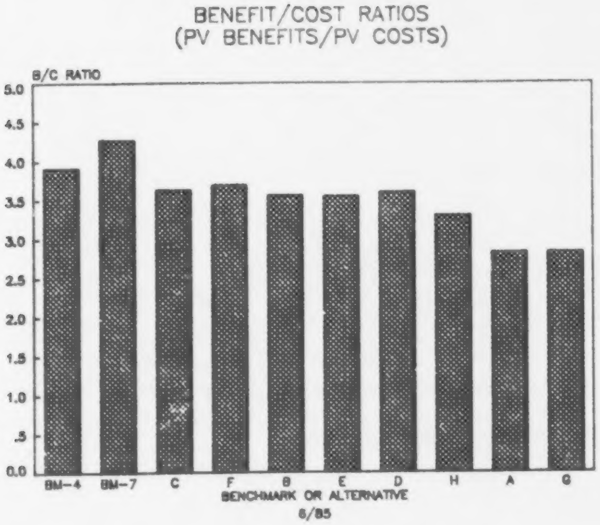


Figure VII

The two Max-PNV Benchmarks (BM-4 and BM-7) are presented as reference points only. While they meet the minimum legal requirements of managing the Forest, they do not represent viable alternatives because they were not designed to respond to the ICO's. They represent the maximum net economic returns available if the priced resources on the Forest were managed solely to maximize present net value. The primary difference between the two benchmarks is the way timber is scheduled for harvesting. BM-4 permits departure from nondeclining yield and stand rotation ages which are based solely on maximization of present net value. It has the highest PNV ($1501.5 million). BM-4 also has the highest first decade average annual harvest level of 89.1 MMCF; 95 percent of which is the higher valued ponderosa and mixed conifer species working groups as opposed to the significantly lower valued lodgepole pine and mountain hemlock working groups.

BM-7 harvests timber on a nondeclining yield basis and stands must have at least reached 95 percent of biological culmination (which generally occurs later than the rotation age at which PNV is maximized) before being considered for final harvest. It has the second highest PNV ($1420.1 million). It provides first decade average annual harvest levels of 49.0 MMCF; all of which are ponderosa pine and mixed conifer working group species. While both of these contain land allocations for the important developed recreation areas on the Forest (approximately 40 percent of their discounted benefits are recreation related), they provide little else in terms of multiple resource management. Note that while BM-7 ranks second in present net value, it has the highest benefit cost ratio.

The PNV's for the alternatives range from $1285.8 million for Alternative C to $661.3 million for Alternative G. Alternative C offers the highest first decade average annual harvest levels of all the alternatives (59.8 MMCF), while Alternative G provides the lowest (32.5 MMCF). While Alternative C has a higher first decade average annual timber program than BM-7 (59.8 MMCF as compared to 49.0 MMCF), 45 percent of its volume is comprised of the lower valued lodgepole pine working group. The recreation related benefits between Alternative C and BM-7 are relatively comparable. Therefore, its important to note that not only is the amount of timber offered for sale an important component of PNV, the mix of species is also a significant factor. In fact, one of the principal differences in the timber programs between the benchmarks and the alternatives is the species mix. All of the alternatives had one form or another of an accelerated lodgepole harvesting program (mature lodgepole conversion periods from 10 to 30 years) in order to address the mountain pine beetle epidemic issue. The benchmarks did not attempt to respond to this issue at all and, therefore, did not accelerate the harvesting of lodgepole. This permitted them to harvest the more valuable ponderosa pine and mixed conifer species earlier which helps to contribute to their higher PNV's.

Generally, as the discounted costs decrease from one alternative to another, so do the PNVs. This can be interpreted to mean that additional investments in resource management between the alternatives usually result in relatively greater returns in terms of increased benefits.

While these relationships hold as a generality, there are exceptions. For example, Alternatives C, B, E, and H incur higher discounted costs than the alternatives preceding them in the PNV ranking. For various reasons, they didn't benefit from the same types of investment returns as did the other alternatives. This is apparent due to the fact that the benefit/cost ratios for the departure alternatives tend to be lower than comparably ranked alternatives (based on PNV) which harvest based on nondeclining yield. In order to understand these complex relationships between PNV, discounted benefits, and discounted costs, a more in-depth examination of their components is needed. Table B-VIII-7 presents the discounted benefits and costs by major resource groups for each alternative. Note that it would be incorrect to assume a direct relationship between the dollar benefits associated with a particular priced output and the cost figure assigned to it. This is because the production of any specific priced output is generally supported by a complex combination of multi-functional input costs. However, they do provide some insight into the complex financial relationships that exist between the alternatives.

Most, although not all, of the cause for the exception in the relationship between PNV and discounted costs for Alternatives B, C, E, and H can be explained by examining the timber related costs and benefits. All four of these alternatives are departures from nondeclining yield. Except for Max-PNV (BM-4), all of the other alternatives harvest timber on a nondeclining yield basis. Given their respective land use prescriptions and resource management objectives, all four of these alternatives had to incur relatively higher per unit timber management, road construction, and organizational support costs than the alternatives preceding them in PNV ranking in order to meet their departure timber output objectives. In general, the departures caused them to harvest in areas with higher access cost and/or lower valued timber. In comparing Max-PNV (BM-7) to Alternative C, the latter receives 6 percent fewer timber benefits at 25 percent more timber management costs. Alternative B receives 3 percent more timber benefits than Alternative F, but only after investing 8 percent more in timber management. Finally, Alternative H receives 7 percent fewer timber benefits than Alternative D, but incurs 11 percent more timber management costs. These figures don't include the higher road construction and organizational support costs also associated with these departure alternatives.

Table B-VIII-7 also shows that from 40 to 75 percent of the total discounted benefits for any alternative can be attributed to the timber resource. Recreation (Wilderness plus Dispersed plus Developed) accounts for anywhere from 25 to 60 percent of the benefits for any one alternative. Timber is responsible for the majority of the discounted benefits for all of the benchmarks and alternatives--ranging from 50 to 68 percent of the totals. Together, timber and recreation benefits sum to more than 97 percent of the total discounted benefits for each alternative.

Except for Alternative A (Current Direction) and Alternative G, timber related discounted costs and benefits account for the primary differences between the PNVs for the alternatives. Timber related benefits range from $1217.7 million for BM-4, to $985.7 million for Alternative C, to $635.1 million for Alternative G. This is a total difference of $582.6 million, and represents an increase of 92 percent from the lowest to the highest timber related benefits received amongst the alternatives. Timber management costs range from $112 million for Alternative G (the lowest) to $194 million for BM-4 (the highest). This is an increase of 73 percent.

Except for Alternative A (Current Direction) and Alternative G which have respective recreation benefits of $343 million and $366 million, the recreation benefits for the other alternatives have a relatively narrow range (from $773.6 million to $707.4 million). This is despite the wide range in recreation land prescriptions between the alternatives. The Alternatives reflect a relatively narrow range in recreation benefits because it was assumed that in the short run, the propensity to participate in recreation would not change much between the alternatives. What would change is where they recreated on the Forest. What differentiates the Alternative A and Alternatives G recreation benefits from the other alternatives is the quality of recreation experience managed for in these two alternatives. They provide lower standards of recreation experiences and, therefore, lower valued recreation outputs than do the other alternatives. This is because of the existing budget levels for Alternative A (Current Direction) and the resource management objectives for,Alternative G.

The differences in PNV between the alternatives can also partly be attributed to the levels of nonpriced outputs which they provide. While these outputs can not be valued in dollar terms, their output levels can often be measured in terms of other units. Table B-VIII-8 presents information which is useful in helping to understand the relationships between some of the key nonpriced ouputs and present net value. It is important to keep in mind that this table is intended to present only general relationships between the nonpriced benefits and PNV. The differences in the output levels and effects should not be interpreted as absolute measureable tradeoffs. Figures VIII through XII graphically depict the surrogate measures of output levels for the nonpriced outputs which will be discussed in the next few paragraphs.

Table VIII-8 Present net Value Change, Returns to Treasury and Counties, and Key Nonpriced Outputs

| | PNV @4% ($MM) | Chge. In PNV ($MM) | PV Costs @4%s ($MM) | Chge. In Costs ($MM) | 1986 Returns To Treas. ($MM) | 1986 Payments To County ($MM) | Chge.In Employ. 1st Dec. (Jobs) | Firewood Reserved For Pers.Use (MCords) | Visual Quality Ret. & Part.Ret. (MAcres) | Eagles, Owls,& Osprey (MAcres) | Unroaded Undev. & Winter Rec. Allocations (MAcres) | Timber Harvest Decades 1 and 2 (MAcres |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Benchmarks: | | | | | | | | | | | | |
| Max PNV(Run-4) | 1501.5 | N.A. | 516.8 | N.A. | 81.0 | 20.3 | +2060 | 0 | 0.0 | 22.6 | 0.0 | 604.1 |
| Max PNV(Run-7) | 1420.1 | -81.4 | 434.2 | -82.7 | 47.6 | 11.9 | +560 | 0 | 0.0 | 22.6 | 0.0 | 386.1 |
| Alternatives: | | | | | | | | | | | | |
| Alt. C | 1285.8 | -134.3 | 489.1 | +54.9 | 34.9 | 8.7 | +550 | 0 | 207.4 | 22.6 | 27.5 | 508.5 |
| Alt. F | 1125.2 | -160.6 | 416.7 | -72.4 | 24.2 | 6.0 | -202 | 60 | 360.1 | 36.6 | 73.0 | 400.4 |
| Alt. B (RPA) | 1124.1 | -1.1 | 439.5 | +22.9 | 21.6 | 5.4 | -258 | 60 | 365.0 | 37.4 | 88.2 | 429.9 |
| Alt. E (Preferred) | 1123.4 | -0.7 | 441.1 | +1.5 | 26.0 | 6.5 | - 21 | 60 | 344.6 | 37.4 | 77.4 | 452.5 |
| Alt. D | 1121.3 | -2.1 | 431.1 | -10.0 | 20.6 | 5.2 | -295 | 0 | 358.6 | 56.4 | 37.9 | 418.2 |
| Alt. H | 1027.2 | -94.1 | 446.6 | +15.5 | 26.3 | 6.6 | -84 | 75 | 411.9 | 68.5 | 126.2 | 445.4 |
| Alt. A (Cur. Dir.) | 741.3 | -285.9 | 407.6 | -39.0 | 28.8 | 7.2 | 0 | 60 | 401.8 | 13.1 | 57.4 | 390.1 |
| Alt. G | 661.3 | -80.0 | 363.8 | -43.8 | 23.8 | 6.0 | -321 | 75 | 426.0 | 67.3 | 133.7 | 336.1 |

It is important to note that the provision of some nonpriced benefits is complementary to the production of priced outputs while the provision of others is contradictory. The contradictory relationships generally mean that more nonpriced outputs can only be provided at the expense of producing fewer priced outputs (primarily timber) and, therefore, lower PNVs. It is a subjective decision as to whether the foregone priced benefits are at least compensated for by the increased outputs of nonpriced benefits.

Maintaining and enhancing the lifestyles of Central Oregonians was identified as one of the more important nonpriced benefits. Of course, this is comprised of several components including the opportunity for diverse recreation experiences in a visually pleasing environment along with clean air and water. Economic stability is also a factor. For this discussion we will cover these as separate nonpriced outputs and in no particular order of importance.

Maintaining and enhancing economic community stability can mean many things to different people and can be measured in various ways. Table B-VIII-8 presents the change in the number of jobs in the local economy during the first decade that could result from the implementation of an alternative. To some extent, the payments to county also provide some insight into the economic base from which the local Governments can provide services to residents of the area. In general, both of these have complementary relationships with the production of priced benefits. "Payments to counties" is calculated as 25 percent of total Forest Service receipts, 99 percent of which are related to harvesting timber. In turn, many jobs in the local economy are directly related to the amount of timber and recreation supplied from the Deschutes National Forest. Table VIII-8 indicates that, as PNV decreases along with the production of priced timber and recreation ouputs, so do the payments to counties and potential number of jobs in the economy.

With regard to the job estimates, one point needs to be explained. Timber related jobs in the area are estimated as a function of the amount of board feet sold from the Forest. While in terms of cubic feet of wood fiber sold, Alternative G is the only alternative which provides lower outputs than Alternative A (Current Direction). However, in terms of board feet, all alternatives except for the two benchmarks, plus Alternative C and Alternative E offer less wood for sale. This anomaly occurs because of the relative share of the total timber harvest volumes in these alternatives which is lodgepole pine. Lodgepole is a relatively small tree. Because of this, fewer usable boards can be milled from the cubic feet of fiber which exist in its stem. In addition, many of the local mills now process these small diameter trees in automated (relatively low labor) mills. Therefore, the substitution of lodgepole pine volume for the volumes from larger trees such as ponderosa pine has a downward pressure on the employment base in the area.

The ease of accessibility to personal use firewood from the Forest is also a component of the Central Oregon lifestyle and considered a nonpriced benefit. Different alternatives investigated various ways of pricing and rationing this material to its end users. The two benchmarks, plus Alternative C, and Alternative D put this material up for sale to the highest bidder. None was set aside for personal use. The other alternatives each set aside either 60 or 75 thousand cords per year for personal use firewood cutters. These relationships are depicted in Figure VIII. To the extent that personal use firewood permits are priced below what this material would normally sell for on the competitive market, the rationing of personal use firewood supplies has a slight downward pressure on PNV (Although the amount of decrease in PNV would probably be small).

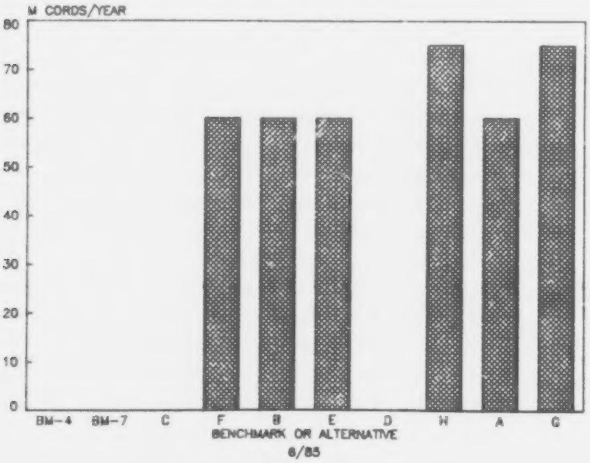

FIREWOOD RESERVED FOR PERSONAL USE
(FIRST DECADE)

**Figure VIII**

The maintenance or enhancement of visual quality in sensitive scenic areas is another nonpriced benefit. In Table B-VIII-8 and Figure IX this output is presented in terms of the amount of acres of retention and partial retention visual quality objectives met in each alternative. While some timber harvesting is acceptable, and even necessary, in order to meet the visual management objectives in scenic areas, the provision of visual quality on the Forest usually comes at some expense to the amount of timber that could be harvested. As more acres are allocated to visual management across the alternatives, the lower the PNV tends to be.

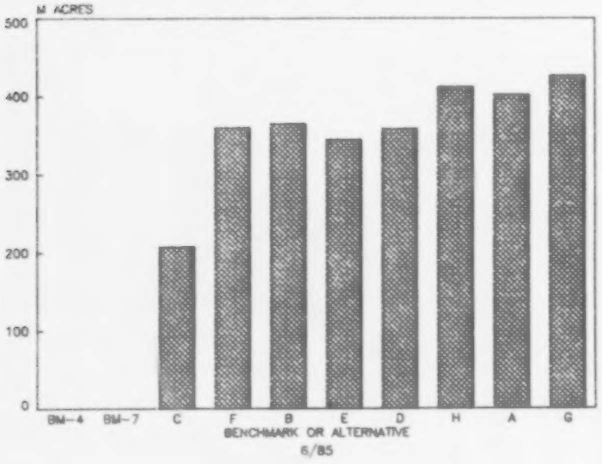

VISUAL QUALITY
(RETENTION AND PARTIAL RETENTION)

Figure IX

The provision and maintenance of habitat for bald eagles, spotted owls, and osprey is also considered a nonpriced benefit. Again, timber harvesting is permitted in these areas, but at reduced levels. Table B-VIII-8 and Figure X depict the amount of habitat provided for these species for each alternative. Generally, as the amount of acres managed for their habitat increases, PNV decreases.

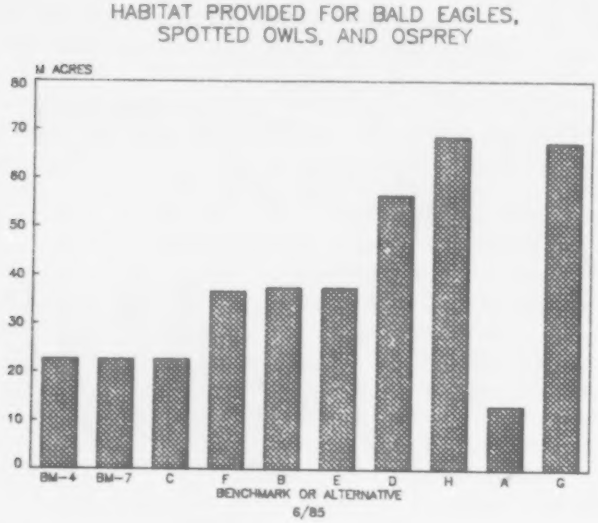


**Figure X**

The provision of opportunities to participate in diverse recreation experiences is another nonpriced benefit. Recreation diversity on the Deschutes is most limited by the amount of opportunities to recreate in unroaded nonwilderness areas. In Table B-VIII-8 and Figure XI this output is measured in terms of amount of unroaded undeveloped and winter recreation allocations outside of wilderness. The tradeoffs between this output and timber are the most extreme. On most of these areas, no programmed timber harvesting is permitted. The conflicting relationship between the provision of recreation diversity and PNV is apparent; the more recreation diversity in terms of unroaded nonwilderness recreation, the lower the timber program, and the lower the PNV.

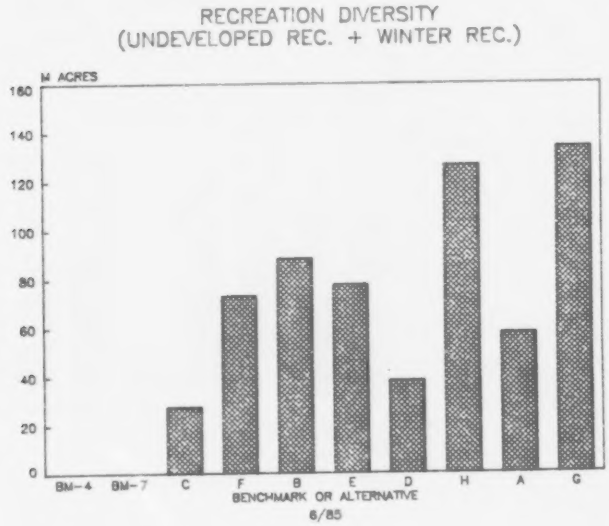


**Figure XI**

The maintenance and enhancement of clean air and water, and the protection of historical and cultural resources, are also, at least to some extent, contradictory to the harvesting of timber. While the provision of these benefits has not been a serious problem in the past, alternatives which greatly increase the amount of acres harvested will make it more difficult to protect these resources. Table B-VIII-8 and Figure XII show that as PNV increases, so do the number of acres harvested.

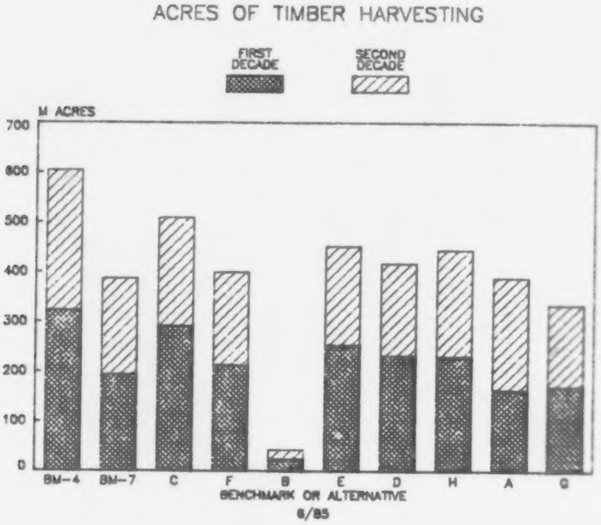


Figure XII

b. U.S. Treasury Cash Flows: Budgets and Receipts

Net returns to the U.S. Treasury are defined as the difference between the total dollar receipts of an alternative and the budget required to implement that alternative. Table B-VIII-9 displays the net cash flows, total budgets, total receipts, and noncash benefits by alternative for the first and fifth decades. The alternatives are ordered in terms of decreasing first decade net cash flows. Note that returns exceed budgets for all alternatives in all decades except BM-4 and BM-7 in the fifth decade. In both of these benchmarks, the fifth decade harvests are comprised mostly of lower valued lodgepole pine stands in areas where the costs of doing business is increased by additional roading, logging, and stand management expenditures.

Table B-VIII-9 Average Annual Net Receipts to the U.S. Treasury (Millions 1982$)1_/

| | Decade 1 | | | | Decade 5 | | | |
|---|---|---|---|---|---|---|---|---|
| | Net Cash Flow | Total Costs | Total Receipts | Noncash Benefits To Users | Net Cash Flow | Total Costs | Total Receipts | Noncash Benefits To Users |
| Benchmarks | | | | | | | | |
| Max. PNV (Run-4) | 58.5 | 25.7 | 84.2 | 27.5 | -9.1 | 19.8 | 10.7 | 57.1 |
| Max. PNV (Run-7) | 31.0 | 18.5 | 49.5 | 27.4 | -12.3 | 25.1 | 12.8 | 57.1 |
| Alternatives: | | | | | | | | |
| Alt. C | 12.8 | 23.5 | 36.3 | 27.4 | 26.7 | 22.8 | 49.5 | 54.5 |
| Alt. A (Cur. Direction) | 12.2 | 17.8 | 30.0 | 14.5 | 39.8 | 19.0 | 58.8 | 18.8 |
| Alt. G | 8.7 | 16.1 | 24.8 | 14.7 | 20.8 | 22.7 | 43.5 | 20.6 |
| Alt. H | 7.0 | 20.4 | 27.4 | 27.5 | 23.3 | 21.4 | 44.7 | 40.9 |
| Alt. F | 6.8 | 19.1 | 25.9 | 27.5 | 34.4 | 20.1 | 54.5 | 45.2 |
| Alt. E (Preferred) | 6.5 | 20.6 | 27.1 | 27.5 | 30.7 | 21.8 | 52.5 | 47.2 |
| Alt. B (RPA) | 2.1 | 20.4 | 22.5 | 27.6 | 32.2 | 22.0 | 54.2 | 44.5 |
| Alt. D | 1.4 | 20.1 | 21.5 | 27.6 | 30.1 | 21.6 | 51.7 | 49.0 |

1 Costs are limited to Forest Service or taxpayer expenditures. Twenty-five percent of the receipts would be paid to counties.

The receipts presented in Table B-VIII-9 represent actual dollar revenues generated by each alternative. For all alternatives, timber stumpage revenues account for over 95 percent of the total receipts. The remainder of the receipts are attributed to from campgrounds and other special use fees collected from Mt. Bachelor Ski Area, recreation residents, other resorts, range permitees, minerals, lands, and power. Figure XIII depicts the estimated average annual receipts by alternative for the first, second, and fifth decades. The most noticeable difference is between the benchmarks and the alternatives. The two benchmarks show declining receipts over time while the alternatives tend to reflect more stable and increasing receipts. This is mostly related to the differences in their timber harvest schedules and the species mix which comprise them. Both benchmarks schedule the more valuable ponderosa and mixed conifer stands in the early decades in order to meet their sole objective of maximizing present net value. In the fifth decades they are both working primarily with the lower valued lodgepole pine stands. In addition, BM-4 is a departure and its fifth decade harvest is 36 percent of what it scheduled for harvest during the first decade. The alternatives, on the other hand, accelerated the harvesting of lodgepole pine over the next 10 to 30 years in order to address the mountain pine beetle issue. This left them with more of the higher valued ponderosa and mixed conifer stands to be scheduled during the fourth and fifth decades.

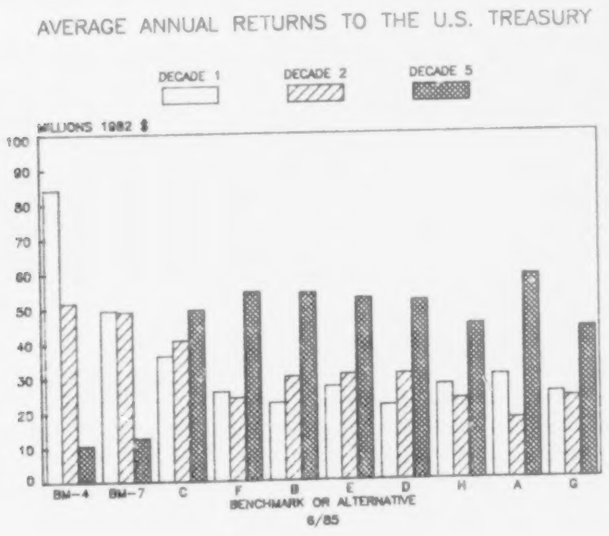


**Figure XIII**

The estimated average annual budgets for the alternatives over this same period of time are much more stable, not varying by more than $2.2 million in any alternative for decades 1,2, or 5. Figure XIV depicts the average annual first decade budgets by alternative by two cost categories; capital investment, and operations and maintenance. At $25.7 million, BM-4 has the highest budget requirements. This is a 44 percent increase over the Alternative A (Current Direction) budget requirements of $17.8 million (1982 constant dollars). Alternative C has the highest average annual first decade budget amongst the alternatives; $23.5 million or 32 percent above the current funding levels. Alternative G requires the least budget to achieve its management objectives; $16.1 million or 90 percent of the current forest budget. Of these budget estimates, $4.9 million were considered to be fixed, or constant, across all alternatives. The remainder varied by alternative and was a function of specific ouptut levels and the management activities needed to achieve them.

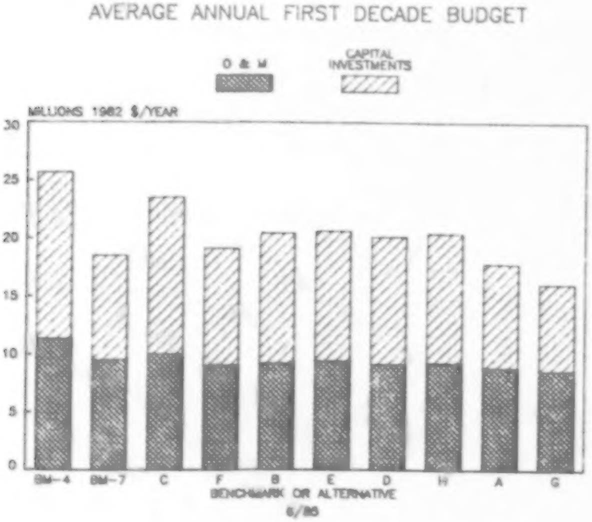


Figure XIV

The majority of the capital investments are for timber management and the Forest road system, with most of it being accounted for by investments in timber production. Most of the Forest transportation network is already in place. None of the alternatives require the construction of new roads in existing roadless areas during the first decade.

### c. Economic Impacts on the Local Communities

Changes in the levels of timber harvests, recreation use, grazing, and Forest Service expenditures on the Deschutes National Forest have the potential to impact the employment and income levels in the local economy. Many of the local communities are particularly dependent upon the forest based timber and recreation resources as the mainstays of their economies. Therefore, the potential economic impacts on the local economy of Central Oregon resulting from the implementation of any one of the alternatives is an important element in the process of selecting a preferred alternative. It was identified as one of the ICO's at the outset of the planning process. The following paragraphs present some information regarding this issue.

The primary economic impacts resulting from changes in output levels on the Deschutes National Forest are felt in Deschutes County and small portions of southern Jefferson and northern Klamath Counties. Therefore, Deschutes County will be used as a surrogate for the total area of influence (For more detail on the economic impact analysis, refer to Appendix B, Section V). However, in recent years more and more communities outside of this traditional area of influence are depending upon the Forest to some extent for their economic well being. For example, up through 1981 approximately 85 percent or more of the timber sold off the Deschutes National Forest was processed in Deschutes, southern Jefferson, and northern Klamath Counties. In 1982 this figure dropped to 78 percent and in 1983 it dropped again to 47 percent! It is primarily lodgepole pine which is being processed outside of the local area. In 1982 and 1983, only 40 percent and 25 percent, respectively, of the lodgepole sold on the Forest was purchased by mills within the traditional local area of influence. As timber supplies in western Oregon and other areas of the State become more restricted due to Wilderness legislation and other land use decisions, buyers are apparently traveling further for their sources of wood.

Figure XV displays the potential first decade economic impacts in terms of jobs and total personal income in the county that could result from the implementation of any one of the alternatives. The alternatives are displayed in order of decreasing PNV from left to right. The impacts are expressed as a percent of the current Deschutes County employment and income base. BM-4 offers the largest potential to provide a stable and growing economy over the next ten years with the opportunity to increase jobs by 13.5 percent and income by 14.1 percent. This is primarily due to its very high average annual first decade timber output levels. Of the alternatives, Alternative C is the only one which provides an opportunity for the local economy to grow in the short term (number of jobs up 3.6 percent, and income up 4.2 percent) based on output levels from the National Forest. The implementation of any of the other alternatives may result in a slight short term downward pressure on both jobs (down from .1 percent for Alternative E to 2.1 percent for Alternative G) and total personal income in the county (down from .1 percent for Alternative E to 2.4 percent for Alternative G). However, and as displayed in Figure XVI, from the second through the fifth decades, each alternative provides a resource base from which the local communities can expect to be able to maintain or enhance their economic livelihoods.

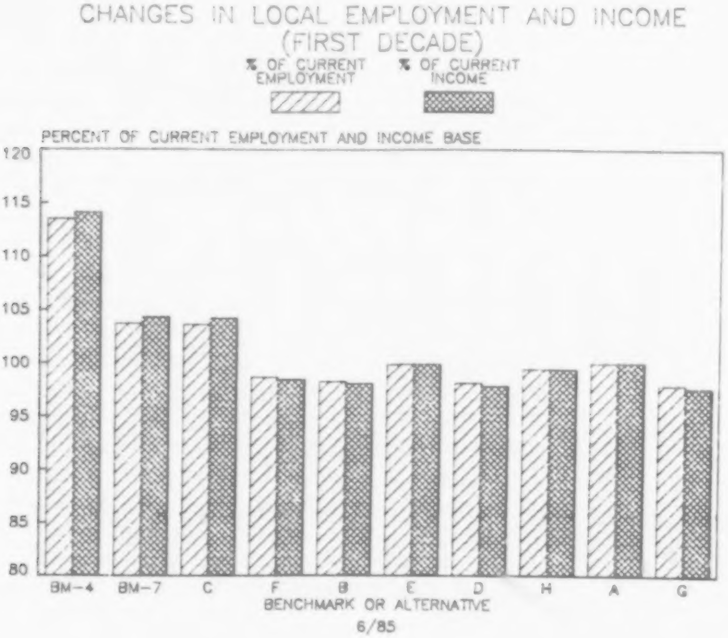


**Figure XV**

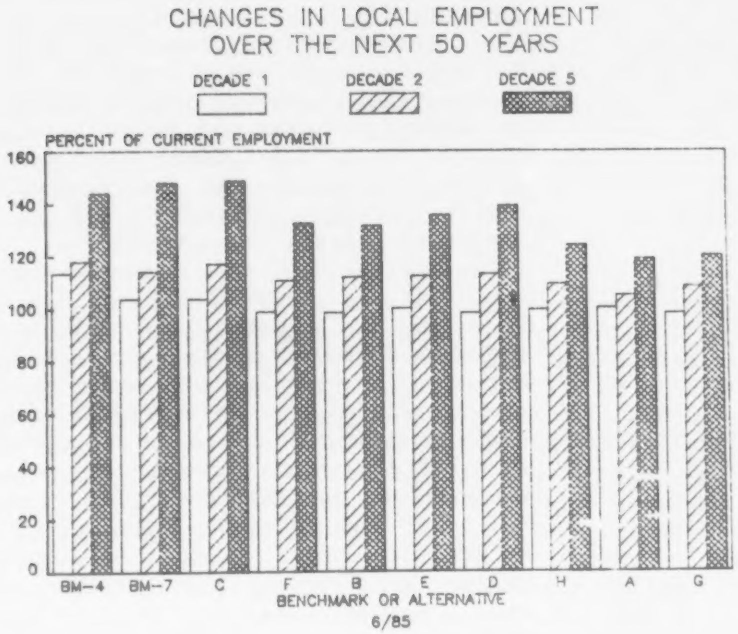

CHANGES IN LOCAL EMPLOYMENT
OVER THE NEXT 50 YEARS
DECADE 1
DECADE 2
DECADE 5
PERCENT OF CURRENT EMPLOYMENT
160
140
120
100
80
60
40
20
0
BM-4
BM-7
C
F
B
E
D
H
A
G
BENCHMARK OR ALTERNATIVE
6/85

Figure XVI

The timber and recreation resources are the primary forest based outputs which are influencing the local economy. Since the recreation use levels will not change that dramatically in the short term from one alternative to another, it is the amount of timber that each alternative proposes to sell which most heavily influences the jobs and income levels during the first decade. Over the longer run (20 to 50 years), the differences between the alternatives in their recreation output levels increase and, therefore, become an important factor accounting for the variation in potential for long term economic growth opportunities.

With regard to the timber related impacts, not only is the amount of wood offered for sale an important factor, but so is the species mix. The potential impacts on timber related jobs in the local economy are estimated as a function of the change in the amount of board feet sold by an alternative as compared to current sale levels (as represented by Alternative A [Current Direction]). In terms of cubic feet, Alternative G is the only alternative which proposes to sell significantly less volume than Alternative A. However, in terms of board feet, all alternatives except for the two benchmarks, Alternative C, and Alternative E offer less volume for sale. This anomaly occurs because of the relative share of the total timber sale program which is accounted for by lodgepole pine for each alternative. Lodgepole pine is a relatively small tree. Because of this, fewer useable boards can be milled from the cubic feet of wood fiber that exist in its stem than can be recovered from the the same amount of cubic feet from stems of larger trees. Since most of the alternatives consider some form of accelerated lodgepole pine harvest in order to address the mountain pine beetle issue, the proposed cubic feet sale levels are well distributed above and below the current sale program, but most of the board foot levels are down somewhat in the first decade or two.

Two other factors are working to influence the relationship between the proposed timber output levels and their impacts on jobs in the local economy. First, many of the local mills now process small diameter trees in automated low labor intensity facilities. Sometimes the small diameter material is chipped and loaded into trucks right at the sale area. Both of these processing techniques imply that the selling of lodgepole pine will not have strong positive impacts on the wood processing related jobs in the local economy. Secondly and as mentioned above, in 1982 and 1983, only 25 to 40 percent of the lodgepole sold off of the Deschutes National Forest was purchased and processed locally. The bulk of it went to the west side of the Cascades or to southern Klamath County. What this means is that the more an alternative accelerates the harvesting of lodgepole pine during the first two decades and substitutes this volume for the ponderosa pine and mixed conifer species, the less opportunity for the wood processing sectors in the local communities to maintain their current employment base.

Recreation is, and will probably increasingly continue to be a mainstay of the Central Oregon economy. In 1983, the Deschutes National Forest ranked 5th among the 19 National Forests in the Pacific Northwest Region and 27th among the 125 National Forests in the Nation in terms of visitor days. Most of the Deschutes National Forest visitors, 70 to 80 percent, come from Oregon. The majority of visitors from outside the State originate from California and Washington. Visitors from Oregon come primarily from three distinct areas: the Portland-Metropolitan area, the Willamette Valley, and Central Oregon. Therefore, the Deschutes National Forest is locally and regionally an important provider of recreation opportunities. Current estimates show the State's population to be increasing at an annual rate of roughly 2 percent. To the extent that an alternative emphasizes the development of capacity for diverse recreation opportunities, recreation use on the Forest is likely to increase at a comparable rate. In accordance, the service industry in the local economy can be expected to grow over the long run to facilitate the recreation visitors, although the jobs will generally be lower paying than the wood processing related manufacturing jobs.

Another means by which the Forest Service can impact the local economy is through its payments to local governments in lieu of taxes. The Forest Service pays 25 percent of its total receipts to county Governments. As was discussed above, most of the Deschutes National Forest receipts are generated by the selling of timber stumpage. To the extent that an alternative emphasizes the production of timber, the local governments will benefit financially. Keep in mind that stumpage receipts are not only related to the amount of volume which an alternative proposes to sell, but also the mix of species. The benchmarks propose to sell relatively more volume of the higher valued ponderosa and mixed conifer

READEX FICHE

species in the early decades, leaving the lower valued lodgepole and mountain hemlock for the later time periods. The alternatives, on the other hand, to varying extents accelerate the harvesting of lodgepole in order to address the pine beetle epidemic. It is because of this that total Forest Service stumpage receipts and payments to counties in lieu of taxes tend to be a little lower than current levels in the first decade for all alternatives except for Alternative C and Alternative E. Figure XVII shows the average annual returns which the counties can expect from the implementation of any one alternative for the first, second, and fifth decades.

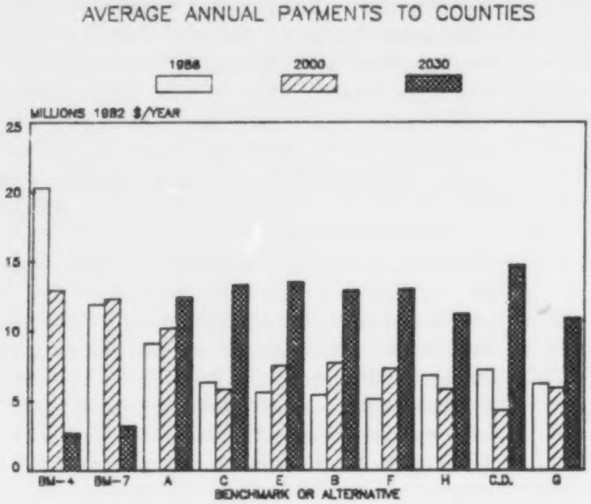


Figure XVII

## 4. Summary of Major Tradeoffs Between Alternatives

The following paragraphs summarize the significant tradeoffs between the alternatives. The focus of the discussions is upon the incremental changes in PNV from one alternative to another as influenced by the production of both priced and nonpriced outputs, and more importantly, the ability of the alternatives to address key planning issues, concerns, and opportunities (ICO's). With regards to the ICO's, the summary will emphasize those to which the responsiveness varies significantly between the alternatives and can be indicated quantitatively.

To provide a framework for assessing these tradeoffs, the ICO's which help to identify the significant differences between the alternatives, and their respective quantifiable indicators of responsiveness are briefly summarized. Then, the quantitative responsiveness of each of the alternatives to these ICO's will be presented in tabular form (Table B-VIII-10). Finally, the incremental tradeoffs between alternatives will be sumarized on an alternative by alternative basis in order of decreasing present net value.

### a. National, Regional, and Local Issues

The management of the Deschutes National Forest has implications for national, regional, and local concerns. For example, RPA timber output targets assigned to the Deschutes National Forest reflect the anticipated needs of national and international markets for wood products. The development of geothermal resources on the Forest could have significant implications for national, regional, and local energy needs in the future. Decisions influencing the scenic quality of the Forest and its ability to provide an adequate supply of diverse recreation opportunities is of importance to regional and local residents who are the primary users of the recreation resorces on the Forest.

Consequently, the entire Forest Planning process revolves around the development of alternative ways of addressing identified issues, concerns, and opportunities concerning the management of the Deschutes National Forest. In fact, the primary differences between the alternatives is in the way they respond to the ICO's. Appendix A fully discusses each of the ICO's that were identified at the outset of the planning process for the Deschutes. However, while all of the identified ICO's are important, only a subset of them are really useful for distinguishing significant differences between the alternatives. The following is a brief summary of the 8 ICO's used to distinguish between the alternatives and their quantitative indicators of responsiveness. Table B-VIII-10 displays the quantitative responsiveness to these ICO's by alternative. Also included in Table B-VIII-10 is the responsiveness of the alternatives to present net value, annual cash and noncash benefits which are not specifically identified in the following ICO's but are indicators of interest to the nation.

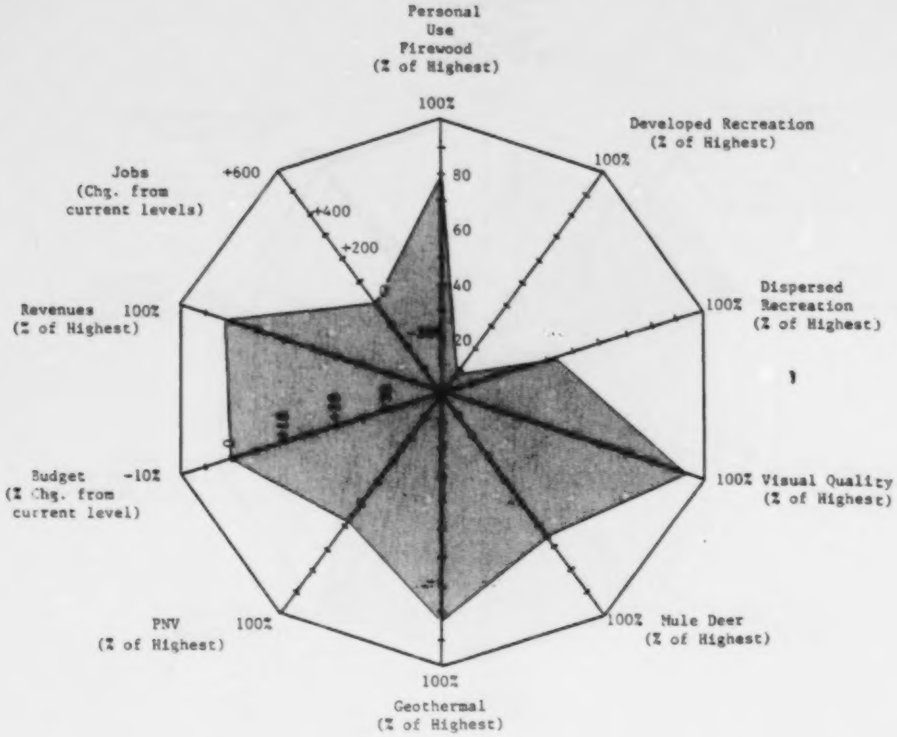
One ICO that is not displayed in Table B-VIII-10 but is useful in evaluating the differences between the Alternatives is "public acceptance". The response to this ICO by the Alternatives is not quantitatively measurable. However, it is likely that the way some ICO's are addressed in some alternatives will cause some conflict and polarization amongst different users of the Forest. Therefore, in the following discussions, public acceptance of an alternative will also need to be considered even though it is not displayed in Table B-VIII-10.

Table B-VIII-10 Quantitative Indicators of Responsiveness to Issues, Concerns, and Opportunities

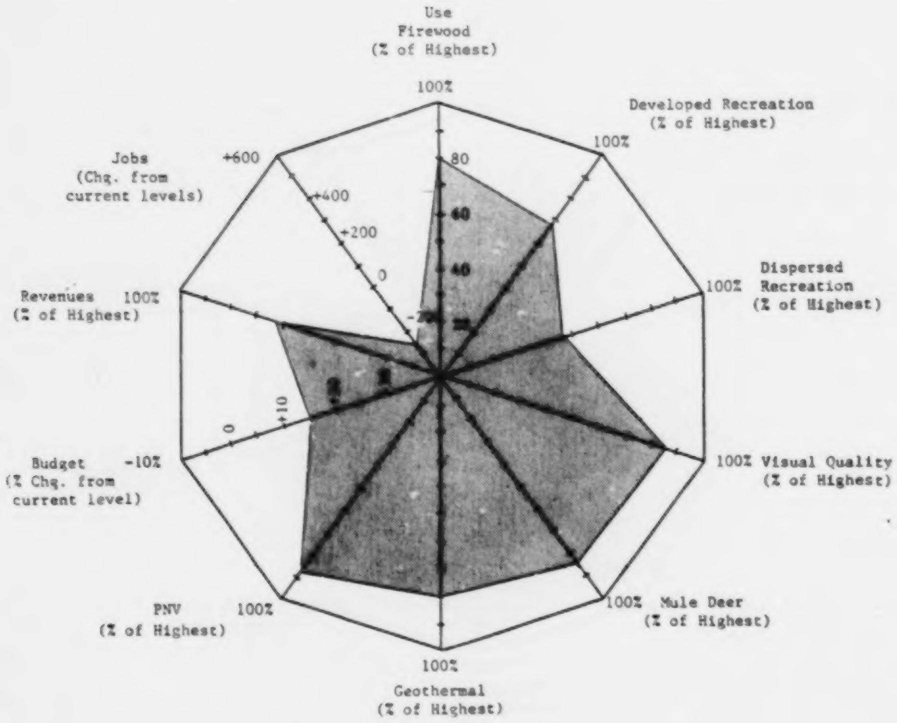
| | | Average Annual Net Cash Flow ($MM) | | Average Annual Noncash Benefits ($MM) | | Response to Issues, Concerns, and Opportunities | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Meets or Exceeds RPA Targets | | | | | | | |
| Alts. Ranked by Decreasing PNV | PNV ($MM) | Decade 1 | Decade 5 | Decade 1 | Decade 5 | Dev. Rec. Target (2,050 MRVD) | Disp. Rec. Target (1,930) MRVD) | Range Target (32 MAUM) | Timber Target (41.9 MMCF) | Timber Target (195 MMBF) | Habitat Improvement Target (6.4 M Acres Equiv. | Average Annual 1st Decade Revenues To Govt. ($MM) | Average Annual First Decade Budget ($MM) |
| C | 1285.8 | 12.8 | 26.7 | 27.4 | 54.5 | 3,493 | 2,686 | 45 | 59.8 | 265 | 30.0 | 36.3 | 23.5 |
| F | 1125.2 | 6.8 | 34.4 | 27.5 | 45.2 | 2,638 | 2,418 | 29 | 39.2 | 174 | 30.2 | 25.9 | 19.1 |
| B | 1124.1 | 2.1 | 32.2 | 27.6 | 44.5 | 2,567 | 2,386 | 32 | 42.0 | 176 | 6.4 | 22.5 | 20.4 |
| E | 1123.4 | 6.5 | 30.7 | 27.6 | 47.2 | 2,770 | 2,493 | 32 | 46.6 | 202 | 27.0 | 27.1 | 20.6 |
| D | 1121.3 | 1.4 | 30.1 | 27.6 | 49.0 | 2,983 | 2,551 | 29 | 41.3 | 171 | 23.5 | 21.5 | 20.1 |
| H | 1027.2 | 7.0 | 23.3 | 27.5 | 40.9 | 2,310 | 2,220 | 32 | 41.7 | 187 | 12.5 | 27.4 | 20.4 |
| A | 741.3 | 12.2 | 39.8 | 14.5 | 18.8 | 1,837 | 2,036 | 29 | 39.6 | 190 | 6.2 | 30.0 | 17.8 |
| G | 661.3 | 8.7 | 20.8 | 14.7 | 20.6 | 2,045 | 2,255 | 26 | 32.5 | 153 | 16.0 | 24.8 | 16.1 |

Table B-VIII-10(Continued)

|  |  | Average Annual Net Cash Flow ($MM) |  | Average Annual Noncash Benefits ($MM) |  |  | Response to Issues, Concerns, and Opportunities |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alts. | PNV ($MM) | Decade 1 | Decade 5 | Decade 1 | Decade 5 | Decade 1 Firewood Reserved For Personal Use (M Cords) | Dev. Rec. (M Acres) | Undev. Rec. (M Acres) | Visual Quality (M Acres) | OR Dept. F&W Mule Deer Pop. Objectives (24,850 Deer) | Acres of High Potential Geothermal Avail. For Leasing (M Acres) | Average Annual First Decade Pay-ments to Counties ($MM) | Potential Impact on # of Jobs in Local Economy in 1st Decade (# Changed |
| C | 1285.8 | 12.8 | 26.7 | 27.4 | 54.5 | 0 | 105.1 | 1.4 | 207.4 | 32,300 | 126.1 | 8.7 | +550 |
| F | 1125.2 | 6.8 | 34.4 | 27.5 | 45.2 | 60 | 74.6 | 62.8 | 360.1 | 28,600 | 80.3 | 6.0 | -202 |
| B | 1124.1 | 2.1 | 32.2 | 27.6 | 44.5 | 60 | 71.8 | 61.9 | 365.0 | 27,100 | 91.5 | 5.5 | -258 |
| E | 1123.4 | 6.5 | 30.7 | 27.6 | 47.2 | 60 | 79.6 | 94.8 | 344.6 | 29,800 | 100.0 | 6.8 | -21 |
| D | 1121.3 | 1.4 | 30.1 | 27.6 | 49.0 | 0 | 98.8 | 18.2 | 358.6 | 25,900 | 105.0 | 5.2 | -295 |
| H | 1027.2 | 7.0 | 23.3 | 27.5 | 40.9 | 75 | 62.1 | 121.3 | 411.9 | 13,300 | 62.8 | 6.6 | -84 |
| A | 741.3 | 12.2 | 39.8 | 14.5 | 18.8 | 60 | 8.9 | 57.4 | 401.8 | 20,300 | 85.9 | 7.2 | 0 |
| G | 661.3 | 8.7 | 20.8 | 14.7 | 20.6 | 75 | 57.4 | 133.7 | 426.0 | 16,700 | 52.8 | 6.0 | -321 |

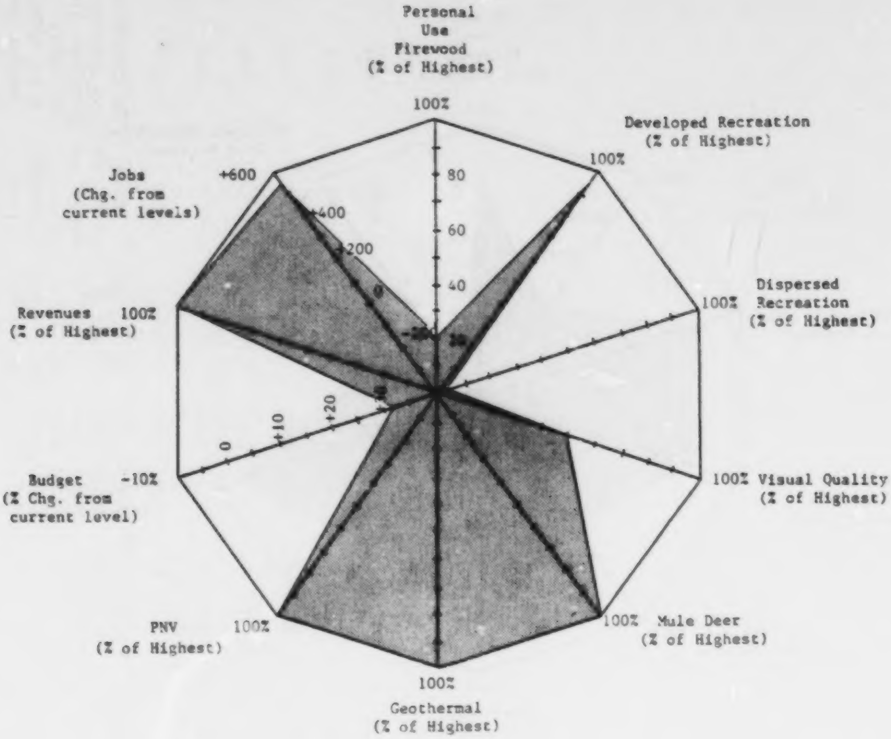


ALTERNATIVE A

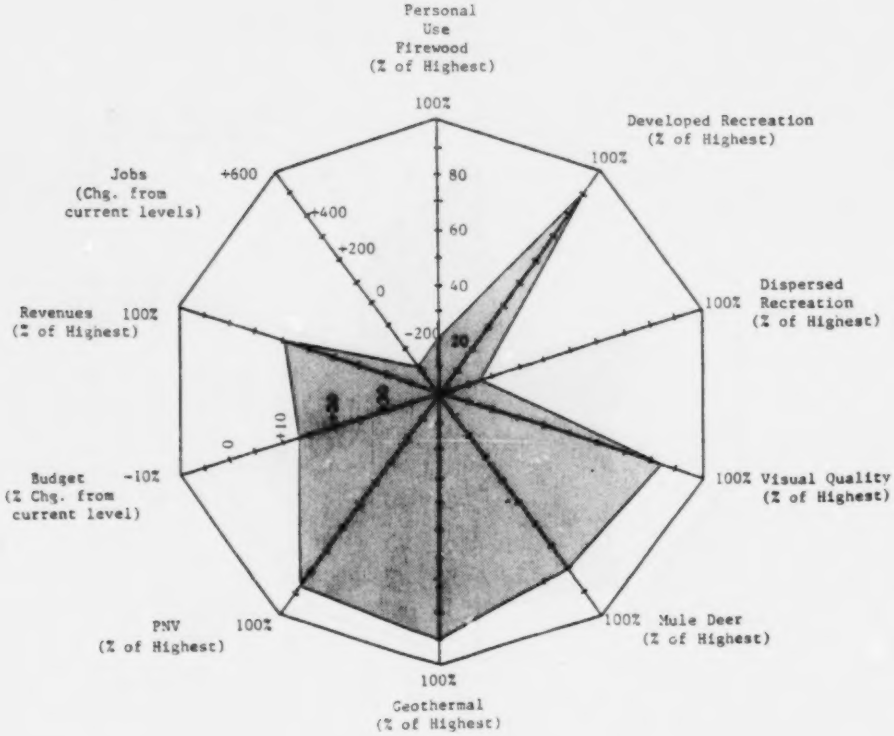


ALTERNATIVE B

**Figure XVIII**

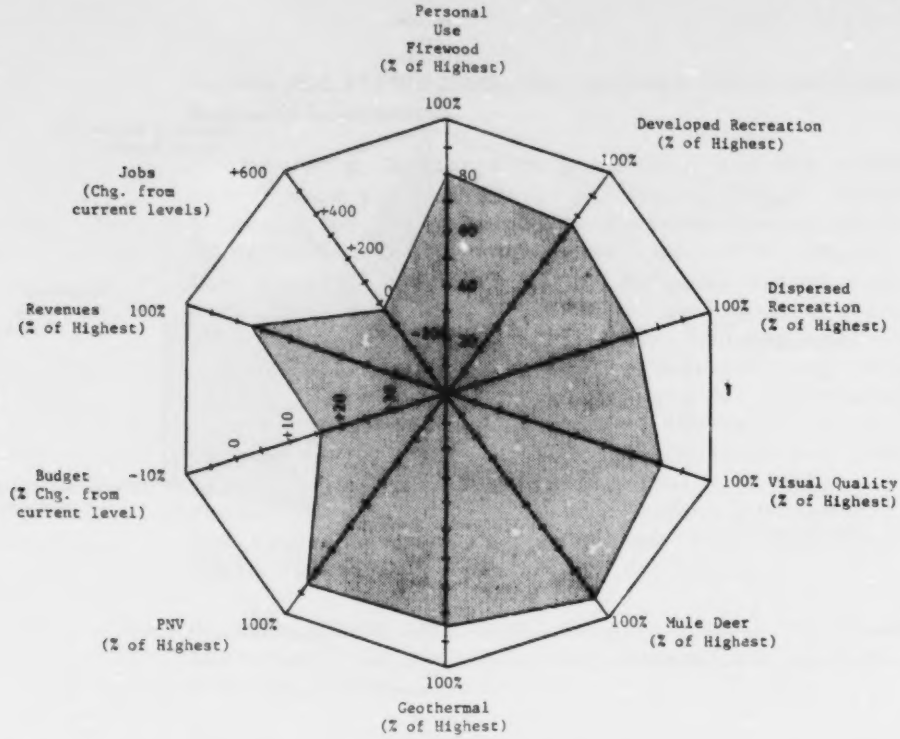


ALTERNATIVE C

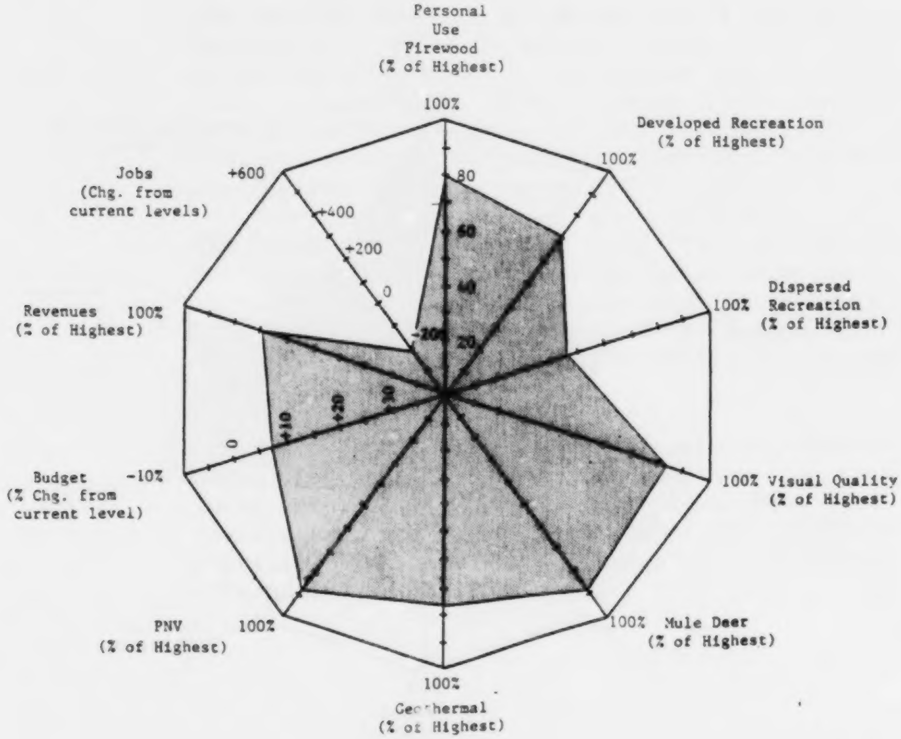


ALTERNATIVE D

**Figure XIX**

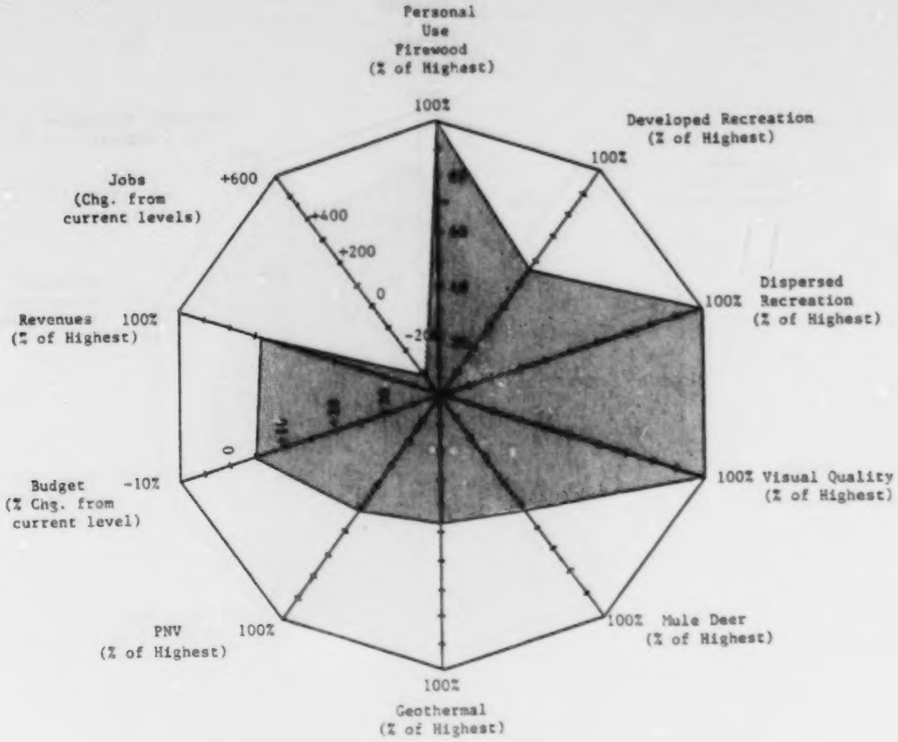


ALTERNATIVE E

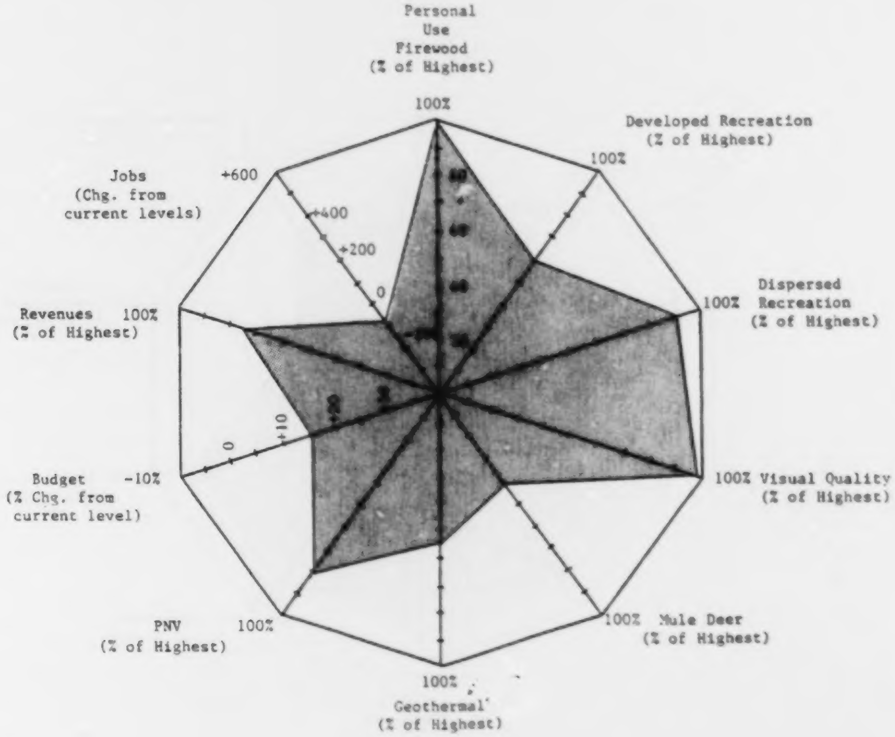


ALTERNATIVE F

**Figure XX**



ALTERNATIVE G



ALTERNATIVE H

Figure XXI

### 1. Can the Forest meet the assigned Resource Planning Act (RPA) Targets?

Based on a National assessment, the RPA planning effort made projections of estimated total national demands for many resources produced on the National Forests. The RPA then assigned each USFS Region in the country a share of the National output targets that would be needed to satisfy anticipated demands for various resources. In turn, the Regional Guide for Oregon and Washington established recreation, range, timber, and wildlife targets for the Deschutes National Forest. The Forest must determine if it is capable of meeting or exceeding these output targets within acceptable environmental limits. The respective first decade RPA targets by resource and the alternatives response to them are displayed in Table VIII-10.

### 2. How should the Forest consider local and regional economies, lifestyles, and population levels in managing Forest lands?

The economy and lifestyles of many local and regional communities are tied to the Forest in many ways. Both tourists and permanent residents are attracted to the wide variety of recreation opportunities available on the Deschutes National Forest. Of the 125 Forests in the National Forests System and the 19 in Oregon and Washington, the Deschutes ranks 27th and 5th respectively in terms of recreation use. Accordingly, the businesses which serve the needs of recreationists and tourists are becoming and will continue to be an increasingly important component of the Central Oregon economy.

The Forest also provides wood for a significant forest products industry in the local communities. In addition, since many people use wood as their primary source of home heating, personal use firewood cutting has become an important element of the Central Oregon way of life.

The resulting consequences of the alternatives to jobs, income, and payments to counties in lieu of taxes are components of this issue. Therefore, the first decade impacts on both jobs and payments to counties in lieu of taxes are displayed by alternative in Table VIII-10.

Many of the other elements of this issue are couched as individual issues which are discussed below. The way each of the following issues is treated has a bearing on this issue. For example, how the mature lodgepole pine is treated in each alternative affects personal use firewood supplies and the amount of raw materials for the forest products industry, which in turn affects the economies and lifestyles of the Central Oregon Region.

3. How should the Forest plan to meet future demands for use of wood as an energy source?

Nearly 60 percent of the homes in Central Oregon use wood burning stoves as a source of heat. An estimated 60,000 cords of personal use firewood are harvested and burned annually. In addition, it is estimated that various commercial operations cut and sell an additional 50,000 cords per year. Most of this fuelwood is lodgepole pine. With the combined effects of current levels of personal use firewood consumption, commercial timber sale contracts, and the mountain pine beetle epidemic, the primary source of accessible firewood supplies as we know it today will be gone in 10 to 15 years. An important element of this issue is the amount firewood which will be reserved for personal use as opposed to competitive bidding on an annual basis during the first decade. This is displayed in Table B-VIII-10 .

4. How should the Forest provide for present and future developed recreation?

Developed recreation on the Forest takes on many forms ranging from the Mount Bachelor Ski Area to small isolated picnic grounds. Demand for camping, boating, and other recreation pursuits requiring facilities and resulting in concentrations of people is continuing to grow, and if it parallels the State's population projections could double within the next 4 to 5 decades. Destination resorts adjacent to the Forest also attract many recreationists to the area. Two questions need to be addressed--which areas should be managed as developed recreation sites and how many acres should they include. The number of acres managed for developed recreation opportunities by alternative are displayed in Table VIII-10 .

5. How can the Forest keep pace with expanding demands for dispersed recreation?

Hiking, rafting, fishing, snowmobiling, sailing, hunting, driving for pleasure, caving, mountain climbing, and general goofing off are all popular dispersed recreational activities. Some of the recreational activities occur in exclusive areas of the Forest. Others, such as cross country skiing and snowmobiling, occur in the same areas and conflicts can arise. Like developed recreation, demand for these types of recreation activities can be expected to grow, and if it parallels the State's population projections could double within the next 4 to 5 decades. Where and how much of the Forest to provide for dispersed recreation activities while minimizing conflicts is the heart of this issue. Table B-VIII-10 displays the number of acres managed for undeveloped recreation opportunities by alternative.

6. How can the Forest maintain scenic beauty while providing goods and services?

The high recreational values of the Forest are directly linked to its beautiful scenery. Viewing volcanic peaks along the Cascade Crest, large ponderosa pine trees along major roads, and free flowing rivers are all part of the recreation experience. Many people prefer to view natural appearing landscapes rather than ones dominated by timber harvesting activities. The key to this issue is to determine which areas and how many acres should be managed for their scenic beauty. Table VIII-10 displays the amount of visually sensitive areas of the Forest which are managed to maintain or enhance their visual quality.

7. What should wildlife populations be?

The public, the Forest, and the Oregon Department of Fish and Wildlife are concerned about several species which are listed below with their currently estimated populations. They are: mule deer (22,800), elk (500 to 700), and osprey (125) pairs. Other species include goshawks, pine martens, and woodpeckers. The question for all the species is what level of emphasis should the Forest place on maintaining or improving habitat for these species? While all of these species are important, we will focus this part of the evaluation on the mule deer populations. The

Oregon Department of Fish and Wildlife has established a population objective of 24,850 deer. The habitat capability of each alternative to meet this objective is portrayed in Table B-VIII-10 .

8. What areas on the Forest should be made available for geothermal leasing and development?

The Deschutes National Forest is considered to have some of the greatest potential for geothermal resources of any area in the Western United States. Approximately 350,000 acres have already been leased. The Newberry Crater is a designated Known Geothermal Resource Area (KGRA). The interior of the Crater is an important recreation area with two large lakes known for their fishing. Campgrounds and resorts are located adjacent to the lakes. The area is also a popular winter sports area for snowmobiling and cross country skiing. There is an active bald eagle nesting territory within the Crater. Numerous unique geological features such as obsidian flows are also found within the Crater. There are also other areas on the Forest which could be leased that are currently not leased. The main thrust of this issue is where and under what conditions should we lease and how should we protect recreation, visual, wildlife, water quality, and other resource values. Table B-VIII-10 displays the number of high potential acres by alternative which are available for leasing.

### b. Tradeoffs and Comparisons Between Alternatives

The following paragraphs summarize the tradeoffs between the Alternatives as displayed in Table B-VIII-10 . The focus is on the incremental changes in PNV from one alternative to another as influenced by the production of both priced and nonpriced outputs, and more importantly, the ability of the alternatives to address the ICO's. The alternatives are discussed in order of decreasing PNV.

#### Max-PNV (BM-4)

Benchmark-4 and Benchmark-7 are presented here as reference points for present net value comparisons only. While they meet the minimum legal requirements of managing the Forest, they do not represent viable alternatives in that they were not designed to address the ICO's. Since these benchmarks were not designed to address issues, their responsiveness to the ICO's is not displayed in Table B-VIII-10.

Benchmark-4 identifies the maximum present net value of the priced resources on the Forest to be $1501.5 million. The primary emphasis in BM-4 is to maximize the discounted timber and developed recreation benefits from the Forest. To do so, timber harvesting is permitted based on a departure from nondeclining yield. The harvest schedule is permitted to fluctuate by as much as 25 percent from one decade to the next. The harvest age of stands is based on maximizing PNV, which occurs sooner than biological culmination. All roadless areas are available for development. The important developed recreation areas are managed to provide their maximum economic returns. Some timber harvesting is also scheduled in these areas. Any additional dispersed recreation benefits are merely incidental to people living in a roaded forested environment.

Max-PNV (BM-7)

BM-7 provides the second highest PNV ($1420.1 million), a 5.5 percent drop from BM-4. The only difference between BM-7 and BM-4 is in the harvest schedule. In BM-7, timber is scheduled for harvesting on a nondeclining yield basis. In addition, stands must have reached at least 95 percent of biological culmination (CMAI) before they can be considered for harvest. Biological culmination generally occurs 10 to 30 years later than economic culmination at a 4 percent discount rate.

Alternative C

Of all the alternatives, Alternative C has the highest PNV at $1285.8 million. This is a 14.4 percent drop from the maximum PNV identified in BM-4, and a 9.5 percent drop from BM-7. Alternative C emphasizes the production of priced resources, much like both BM-4 and BM-7. It permits harvest scheduling based on departure from nondeclining yield, but like the other alternatives, stands must reach 95 percent of biological culmination before being considered for final harvest.

What really differentiates Alternative C from BM-4 and BM-7 is that it is designed to address the ICO's and is an implementable alternative. With regards to the timber program, one of the key differences between Alternative C and the Benchmarks is its aggressive accelerated harvesting of mature lodgepole pine stands in order to address the issue related to the mountain pine beetle epidemic. Over the next 15 years, it proposes to convert about 227,000 acres of mature and overmature natural lodgepole stands to managed plantations. This increase in lodgepole pine volume is in addition to maintaining near historic levels of ponderosa pine and mixed conifer volumes. Consequently, it has the highest first decade harvest of any alternative at 59.8 MMCF/year (compared to 89.0 MMCF/year for BM-4).

Alternative C exceeds all of the range, recreation, timber, and wildlife RPA targets. In doing so, it generates the largest amount of first decade revenues to both federal and local governments of any of the alternatives. However, this is not without a cost. Alternative C requires the highest budget of all the Alternatives (32 percent more than current funding levels).

Like BM-4 and BM-7, Alternative C also has a strong emphasis for developed recreation benefits. It assigns the most acreage of any alternative to the provision of developed recreation opportunities. However, it provides the least opportunities to meet future needs for dispersed roaded and unroaded recreation.

Alternative C is the most favorable alternative from a geothermal leasing and development standpoint. While this is not reflected in the present net value of the Alternative, this could result in a real economic plus to the local economy sometime in the next 10 to 20 years.

Of all the alternatives, Alternative C provides for the most opportunity for the mule deer population to increase. In the future this could be translated into more hunting days and, therefore, more hunter expenditures in the local economy.

Alternative C is the strongest Alternative in terms of providing the necessary timber and recreation outputs to support the local employment base and provide opportunity for growth in the future should the demand for forest based resources continue to increase. Other than that, such nonpriced benefits as visual quality, recreation diversity, and easy access to personal use firewood will be at lower standards than today.

Despite its strong economic performance, Alternative C may lead to some conflicts and polarization amongst local communities and other users of the Forest due to its strong commodity development emphasis

## Alternative F

At $1125.2 million, Alternative F has the second highest PNV of the alternatives. This represents a 12.5 percent drop from Alternative C. Alternative F proposes to harvest timber on a nondeclining yield basis. It has a significantly lower first decade harvest level than Alternative C (39.2 MMCF/year as compared to 59.8 MMCF/year). While some of this is due to harvesting based on nondeclining flow as opposed to Alternative C's departure, another component of the tradeoff is Alternative F's emphasis of the visual resource in sensitive scenic areas. Alternative F also places more emphasis on unroaded nonwilderness recreation and less on developed recreation than does Alternative C. This is also reflected in its lower discounted recreation benefits.

Of all the alternatives, Alternative F has the highest benefit/cost ratio (3.70:1 as compared to 3.63:1 for Alternative C which has the second highest). Some of this can be attributed to its more moderate acceleration of lodgepole; it converts 196,000 acres over 20 years. These sales tend to be more expensive and yield lower timber benefits. In turn, it offers relatively high volumes of ponderosa pine which tend to have better returns per dollar invested. Of all the alternatives, Alternative F has the second to lowest timber management, road construction, and organizational support costs. It ranks fourth in total discounted benefits.

Despite its relatively strong performance with regard to economic efficiency, Alternative F falls short of both its range and timber RPA targets. It ranks fourth in terms of cash returns to the government (down 16 percent from current revenues), and has the 5th highest budget requirements (up 7 percent from current funding levels).

While Alternative F provides less developed recreation opportunities than Alternative C, it does offer a more diverse recreation opportunity spectrum through its increased emphasis of dispersed recreation.

Alternative F is considered restrictive in the amount of high potential geothermal acres it opens up for leasing (80.3 M Acres as compared to 126.1 M Acres in Alternative C).

Alternative F may result in some slight downward pressure on employment opportunities primarily due to its substitution of lodgepole pine for the more labor intensive mixed conifer species. On the other hand, it sets aside 60,000 cords of personal use firewood per year which is a plus with regards to maintaining that aspect of the Central Oregon lifestyle. Visual quality benefits are much higher than Alternative C and only a little lower than the Current Direction (Alternative A). Finally, it exceeds the Department of Fish and Wildlife population targets for deer.

It is anticipated that Alternative F would not cause any significant conflicts or polarization within local communities and other users of the Forest if it were selected as the Preferred Alternative.

### Alternative B

The PNV for Alternative B is $1121.3 million, only $1.1 million less than Alternative F. In terms of the emphasis of priced versus nonpriced outputs, Alternatives F and B are similar. Alternative B provides somewhat higher timber benefits due to its departure harvest schedule which allows it to meet the RPA target harvest level of 42.0 MMCF/year. However, these increased timber benefits were equally matched by higher timber management, road construction, and organizational support costs. Its benefit/cost ratio is 3.56:1 as compared to 3.70:1 for Alternative F.

Alternative B meets or exceeds all of the RPA targets. In doing so, it returns 5.5 million dollars to local county governments (7th highest), and incurs the 3rd highest budget.

While its recreation diversity is similar to Alternative F, Alternative B is more favorable in its flexibility with regards to geothermal leasing. However, its proposed leasing within the Newberry Crater may cause some polarization.

In terms of nonpriced benefits, Alternative Bmeets or exceeds those provided by Alternative F with regard to personal use firewood and visual quality. Because Alternative B converts 208 thousand acres of lodgepole over 15 years, the substitution of the resulting volume for the more labor intensive ponderosa and mixed conifer tree sizes may cause more downward pressure on the employment base in the local economy than does Alternative F.

Alternative E (Preferred)

At $1123.4 million, Alternative E has the fourth highest PNV of all alternatives, only $.7 million less than Alternative B which has the next highest PNV. Alternative E harvests timber on a departure from nondeclining yield basis and has a first decade annual harvest level of 46.6 MMCF (Second highest amongst all Alternatives).

Due to its departure harvest schedule, Alternative E meets or exceeds all of the RPA targets. In doing so, it generates the third highest revenues to both federal and local governments. However, it also requires the second highest budget (16 percent higher than current funding levels).

Alternative E, like Alternatives B and F, offers a diverse spectrum of recreation opportunities. It is somewhat stronger in its attempt to provide for unroaded nonwilderness experiences which is becoming one of the limited opportunities on this Forest.

It is the third highest in the amount of acres it permits for geothermal leasing, behind Alternatives C and D.

With regards to nonpriced benefits, Alternative E would maintain the firewood burning aspect of the Central Oregon lifestyle by setting aside 60,000 cords of personal use firewood per year during the first decade. Compared to Alternative B, Alternative E offers slightly fewer benefits pertaining to visual quality. However, it exceeds both the States targets and Alternative Bs output levels for projected mule deer populations. Finally, due to its relatively high first decade timber sale levels, Alternative E provides the resource base to maintain the Central Oregon economy.

Alternative D

Alternative D has the 5th highest PNV of all the alternatives. At $1121.3 million it is only $2.1 million lower than the PNV of Alternative E. Alternative D schedules timber harvesting on an even flow basis as opposed to Alternative E's departure from nondeclining yield. In fact, the primary reason Alternative E has a higher PNV is because its departure to meet RPA timber targets allowed it to generate $11 million more in discounted timber benefits than Alternative D.

While Alternative D meets or exceeds the recreation and wildlife RPA targets, it falls short with regards to timber and range. Consequently, it ranks 7th in terms of its returns to government (Down 40 percent from current returns to government). It ranks fifth in budgetary requirements, requiring a 13 percent increase above current funding levels.

Alternative D has a relatively strong emphasis towards developed recreation at the expense of dispersed recreation opportunities--particularly unroaded nonwilderness. This results in a less diverse recreation opportunity spectrum than that of Alternative E.

With regard to geothermal leasing opportunities, Alternative D makes available 105 M Acres and is second only to Alternative C.

Alternative D is also more disruptive of the current lifestyles than Alternative E in that it reserves no lodgepole for personal use firewood collection. This means the personal use firewood collector will be competing with the commercial firewood purchasers for this resource and probably paying prices commensurate with true market values. Also, because of the lower first decade timber volumes in Alternative D as compared to Alternative E, this alternative will result in more restricted wood processing related job opportunities in the local communities. On the other hand, while both alternatives have about the same amount of acres meeting the retention and partial retention visual management objectives, Alternative D captures some of the more important sensitive areas through its allocation of land to the Intensive Recreation and Scenic View Management Areas. Finally, Alternative D provides enough mule deer habitat to enable it to exceed the Department of Fish and Wildlife population targets.

### Alternative H

Alternative H has a PNV of $1027.2 million, 6th highest of the alternatives, and $94.1 million lower than Alternative D. Alternative H schedules the harvesting of timber on a departure from nondeclining yield basis in order to maintain current harvest levels on its smaller land base. Its increased harvest levels on the reduced land base causes it to incur the second highest discounted timber management costs of all alternatives--second only to Alternative C. Also, its $13 million of increased timber investments over Alternative D actually returns $52 million less discounted timber benefits because it is forced to harvest more volumes of lower valued species in decades 2 through 5 in order to compensate for its reduced land base. Alternative H also yields $27.8 million fewer discounted recreation benefits than Alternative D. The decrease in recreation benefits are primarily attributed to its provision of limited capacity for meeting projected future developed recreation needs.

Alternative H meets all of the RPA targets except timber, which it just barely falls short of. Because of its relatively high volume of ponderosa pine during the first decade (second only to Alternative C), Alternative H returns the third highest revenues to federal and local governments in the first decade. However, it also requires the third highest budget (14.6 percent above the current funding levels).

Alternative H offers the second highest emphasis of undeveloped recreation of all the alternatives, but only at the expense of a rather limiting capacity for future developed recreation needs.

Alternative H is also the second most restrictive alternative with regards to promoting the leasing and future development of the Forests geothermal resources.

With regard to nonpriced benefts, Alternative H ranks among the highest--possibly second only to Alternative G. Because of its relatively stable first decade timber outputs as compared to the current harvest levels, it causes only a modest downward pressure on the local timber employment base. The downward pressure results because Alternative H substitutes some lodgepole pine for the more labor intensive mixed conifer species offered in the current timber sale program. It also proposes setting aside 75,000 cords of personal use firewood per year which is a plus for maintaining the current lifestyles of Central Oregonians. In addition, it is second in its emphasis towards maintaining and enhancing visual quality on the Forest. On the negative side, it is last in terms of its projected mule deer populations and, as a result, fails to meet the States population objectives for this species.

## Alternative A (Current Direction)

Of the eight alternatives, Alternative A ranks 7th in present net value. Its PNV is $741.3 million, $285.9 million below Alternative H. Its low PNV ranking is due to the fact that of all the alternatives, the recreation benefits generated by Alternative A are the lowest. Its discounted recreation benefits totaled to $343 million as compared to the $707.4 million of Alternative H. There are two reasons for this. First, the existing management plan for expanding intensive recreation capacity is quite restrictive; not allowing enough flexibility to adapt and expand as future demands for developed types of recreation experiences increase. With regard to the projections of future recreation use trends and their associated benefits, this limited capacity for expansion was a ceiling on the amount of developed recreation consumption this Forest could provide.

The second cause is related to the standard of recreation quality which is provided by Altenative A. Two sets of recreation values were used for each type of recreation opportunity provided on the Forest during the development of the benchmarks and alternatives: standard and less than standard. The standard quality experiences had higher benefits associated with them. They also involved higher capital investment and operations and maintenance costs. On the other hand, the less than standard quality experiences had lower benefits and management costs. The standard recreation experiences return more discounted benefits per dollar invested than do the less than standard. However, it was believed by the ID Team that at current funding levels, the Forest is providing recreation opportunities at the less than standard level of quality. Therefore, the discounted benefits associated with this Alternative are quite lower than the others. In fact, Alternative A and Alternative G have the lowest benefit/cost ratios of all the alternatives ($2.82 of discounted benefits for each dollar invested). This is primarily due to the low returns associated with dollars invested in less than standard recreation opportunities. Since the timber related benefits for Alternative A rank fifth amongst the alternatives, some increased investment in managing the recreation resources could enhance the overall PNV ranking of this alternative.

In addition to its relatively low present net value, Alternative A also fails to meet the developed recreation, range, and timber related RPA targets.

Despite this, it results in the second highest payments to counties because of its rich ponderosa pine and mixed conifer species mix during the first decade. It also requires the second lowest funding levels of all the alternatives.

In addition to ranking fifth in terms of acres available for geothermal leasing opportunities, Alternative A also does not recognize the Newberry Crater as a Known Geothermal Resource Area (Since the KGRA was formed after the development of the current land management plan).

In terms of nonpriced benefits, Alternative A ranks quite high. In fact, it serves as the standard with which to compare the other alternatives with regards to some measures of the nonpriced benefits such as jobs, visual quality, and the abundant supply of personal use firewood. Implementation of this Alternative implies maintaining the status quo as far as the economy is concerned during the first decade, although future decades would witness changes. Alternative A ranks third in the amount of acres it proposes to manage for scenic quality, right behind Alternative H. On the other hand, Alternative A is the sixth lowest of all the alternatives when it comes to projected mule deer populations, and fails to meet the States population targets for this species. It also ranks relatively low in terms of both the amount of unroaded recreation and the amount of developed recreation which it provides, thus restricting the diversity of the recreation opportunity spectrum.

### Alternative G

At $661.3 million, Alternative G has the lowest PNV of all alternatives. This is a function of both its relatively low discounted timber and recreation related benefits. The timber benefits are low because Alternative G offers the lowest first decade timber sale program at 32.5 MMCF/year, 6.1 MMCF/year lower than Alternative A and 27.3 MMCF/year lower than Alternative C. The recreation benefits are low because of its relatively low capacity to provide for developed recreation opportunities, and the less than standard quality of recreation opportunities which it is budgeted to manage for. It and Alternative A have the lowest benefit/cost ratios at $2.82 of benefits for each dollar invested. This is primarily due to the low returns generated per dollar of investment in the recreation resource.

Alternative G falls short of the range, developed recreation, and timber RPA targets. Yet, while Alternative G offers the lowest average annual first decade timber sale quantities, its returns to federal and local governments are higher than those of both Alternative B and Alternative D. This is due to its relatively slow conversion of mature lodgepole pine over the next few decades which permit a larger portion of the allowable sale quantity to be composed of the more valuable ponderosa and mixed conifer species. A positive aspect of the finances regarding Alternative G is its budget requirements. It is the only Alternative which proposes a budget lower than current funding levels (a decrease of 10 percent).

Alternative G is the most restrictive of all the alternatives with regards to providing opportunities for the leasing and possible future development of geothermal resources on the Forest. It is also rather limiting in its provision of opportunities to meet future needs for developed types of recreation activities. Both of these are the result of its strong emphasis towards dispersed recreation and the maintenance of roadless areas in an undeveloped condition. This may lead to some conflict and polarization amongst local communities and other users of the Forest.

In terms of nonpriced benefits, Alternative G ranks highly in all aspects except economic stability in the local communities. Its implementation could result in the most downward pressure on job opportunities and income levels in the local economy. This is primarily due to its low timber sale program. On the other hand, it ranks highest in terms of the amount of personal use firewood available to the citizens of Central Oregon. It also ranks highest with regards to maintaining and enhancing visual quality and providing unroaded nonwilderness recreation opportunities. However, Alternative G falls short of the States mule deer population targets, proposing lower population levels in the future than curently exist.

# APPENDIX C

# Roadless Areas

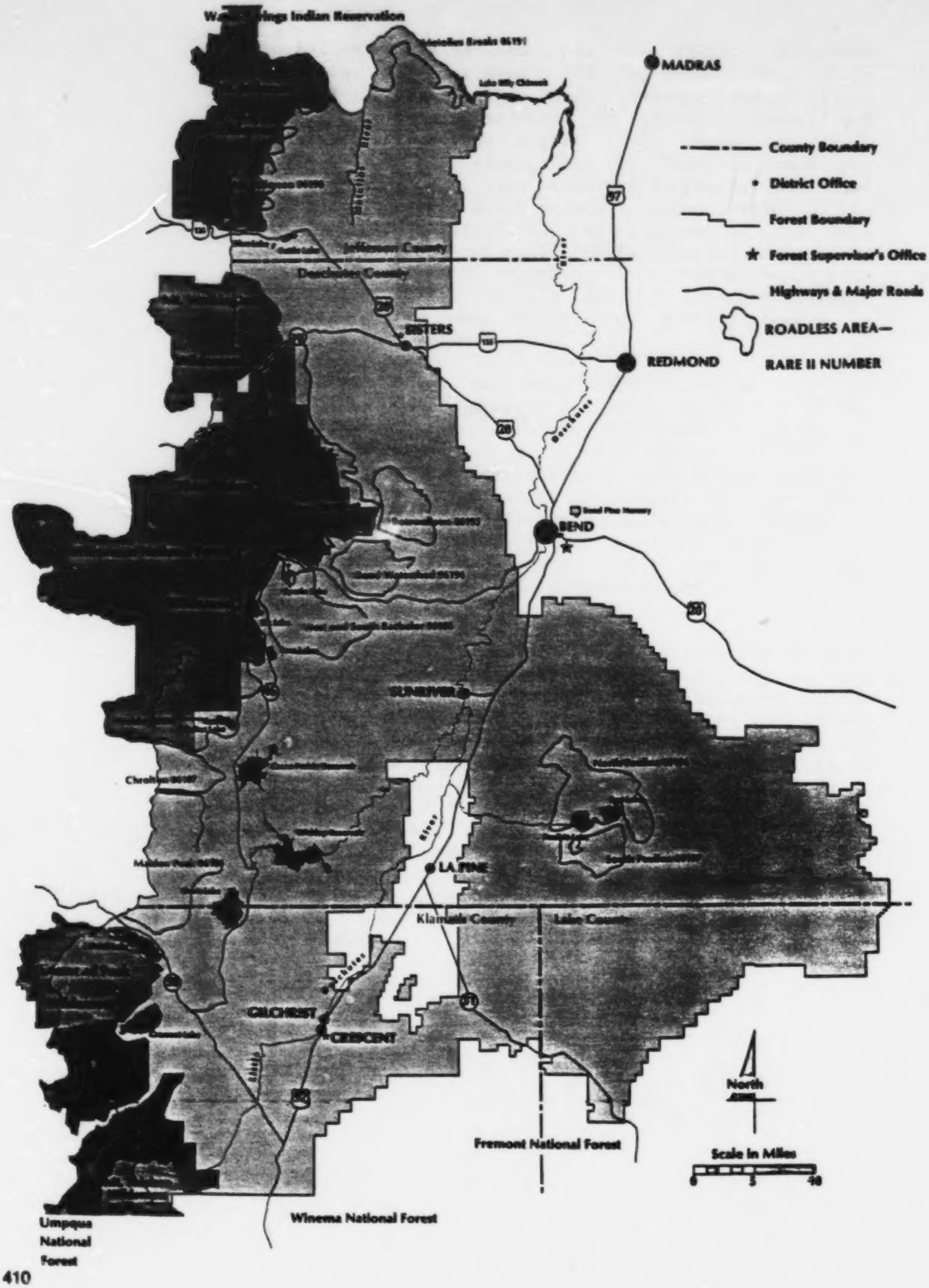


Figure XXII

| RARE II Number | Roadless Area | Net RARE II Acres | New Inventoried Acres | Reason For Change |
|---|---|---|---|---|
| 6198 | Mtn. Jefferson | 2,700 | 2,608 | Excluded areas which have been Roaded since 1979. |
| 6191 | Metolius Breaks | 10,900 | 10,907 | Adjustments made as a result of some roads and acquiring private land that was unroaded. |
| 6103 | Mt. Washington | 7,300 | 0 | Was included as Wilderness in 1984 with only small slivers of unroaded lands left. |
| 6192 | Three Sisters | 36,800 | 8,315 | Majority was included in Wilderness in 1984. A long narrow strip of unroaded land remains. |
| \195 | West-South Bachelor | 32,500 | 30,945 | Reduction due to developments at Mt. Bachelor Ski Area and and excluding some roads. |
| 6193 | Bearwallows | 8,100 | 7,337 | Reduced to exclude some roads and an electronic site of Bearwallow Butte. |
| 6194 | Bend Watershed | 16,200 | 14,250 | Reduced as a result of roads constructed during the Bridge Creek fire and post fire salavage logging and rehabilitation. |
| 6106 | Waldo | 9,700 | 4,992 | Reduced as much of the area was included in Wilderness in 1984. |
| 6107 | Charlton | 9,280 | 7,243 | Reduced because of some new road construction and logging |
| 6196 | North Paulina | 22,450 | 21,622 | Reduced because of some new roads. |
| 6197 | South Paulina | 10,200 | 9,915 | Reduced to exclude some roads and a power line. |
| 6108 | Maiden Peak | 29,420 | 27,008 | Reduced because of new roads and timber sales. |
| 6111 | Odell | 14,150 | 0 | Included in wilderness in 1984. |
| 6109 | Cowhorn | 22,450 | 0 | Included in Oregon Cascade Recreation Area in 1984. |
| 6132 | Windgo- Thielsen | 22,300 | 0 | Included in Wilderness and Oregon Cascade Recreation Area in 1984. |
|  | Total | 254,450 | 145,142 |  |

# BEAR WALLOWS ROADLESS AREA
## (RARE NO. 06193)

## DESCRIPTION - THE EXISTING CONDITION

### History

The Bear Wallows Roadless Area (RA) was included in both the RARE I and RARE II analysis processes. Some boundaries have changed since 1979. Several small logged areas and the associated roads were inadvertently included within the RA during the initial inventory. The boundary was adjusted to exclude these portions from the RA. In addition, the Bear Wallows Butte electronic site and access road were excluded by adjustment of the eastern boundary. These exclusions were based on the premise that logging activities and other human developments are inconsistent with Roadless Area values.

### Location and Access

The Bear Wallows RA contains 7,337 acres and lies within portions of the following townships:

T. 17 S., R. 9 E.
T. 17 S., R. 10 E.

The RA lies on the eastern slope of the Cascades about one mile north of Tumalo Creek in the Bend and Sisters Districts of the Deschutes National Forest, Deschutes County, Oregon.

Access is gained by traveling west from Bend, Oregon, on County Route 4601 for 11 miles, then north on Forest Roads 4601 and 4602 for 6 miles.

No developed trails exist within the RA.

### Geography and Topography

The topography of the RA is fairly flat and slopes gently to the east. The steepest part is along the northeast boundary. There are no dominant landforms or bodies of water within the RA.

Elevation ranges from 5000 feet to 6600 feet.

Precipitation ranges from 25 to 35 inches per year and falls primarily in the form of snow. The porous volcanic soils causes most of the moisture to soak directly into the ground.

### Soil Types

The soil types are based on the Deschutes National Forest Soil Resource Inventory.[1]

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[1] Daniel H. Larson, Soil Resource Inventory, Deschutes National Forest, Pacific Northwest Region, 1976.

The soils are a high elevation type consisting of a shallow layer of light brown sandy mazama ash over stony glacial till. In the mountain hemlock stands a bleached gray soil occurs in the surface horizon. On steep slopes, rock outcrops and bare rock talus slopes are common.

| Land Type | Landform | Percent Slope | Elevation |
|---|---|---|---|
| 16 | Sloping Uneven Glaciated Uplands | 15-40 | 4300-6500 |
| 17 | Gentle Uneven Glaciated Uplands | 0-30 | 4200-6500 |
| 19 | Glaciated Uplands | <20 | 4700-6000 |
| 84 | Dissected Sideslopes | 30-80 | 6000-7000 |
| 85 | Ridgetops and Flats | 0-30 | 6000-6800 |

### Vegetation

The plant communities present are: lodgepole pine/sedge-lupine, mixed conifer/snowbrush-manzanita/sedge-penstemon, mountain hemlock/grouse huckleberry, and lodgepole pine/grouse huckleberry.

The lodgepole pine communities are currently infested by the mountain pine beetle to epidemic proportions.

### Ecosystem Type

About 62 percent of the RA is lodgepole pine forest with mixed conifer forest accounting for another 25 percent. A small amount of ponderosa pine forest is found at the northern tip of the area, and mountain hemlock forest is represented in trace amounts at the southern end.

Most of the forested ground (89 percent) is classified as being in "mature" or "old growth" successional stages. Approximately 15 percent of the total is a mixed conifer type. Rocky ground occurring at the south end accounts for about 8 percent of the area. Early successional stages are present in trace amounts.

Riparian plant communities are almost nonexistent with the exception of very narrow lands (less than 10 feet) intermittently located along Three Creek, Bull Creek, and a small meadow at Bearwallows. The banks of Three Creek are predominantly grass-covered, with occasional pockets of willow, bogbirch, or aspen.

This area is summer range for mule deer of the Upper Deschutes Game Management Unit herd. These animals are thought to winter in the Tumalo Reservoir-Plainview area. The predominance of mature forest, with negligible amounts of early-successional or riparian plant communities makes the area relatively poor deer range.

The RA may also be summer range for elk. It is thought that an occasional family unit or single individuals may use the area. The lack of riparian plant communities is the reason for little use.

About 3 miles of Three Creek pass through the RA. This stream segment has very low fisheries potential, although a small population of brook trout is present throughout. Stream gradients averaging 8 percent may partially account for its low potential. Bull Creek is an intermittent stream without fish.

### Current Uses

The area was inventoried under the Recreation Opportunity Spectrum (ROS) as being Semiprimitive Nonmotorized. The primary recreation use has been hunting and snowmobiling, and this has been very limited. No recreation use statistics have been developed for the area.

Some woodcutting is occurring along the boundaries where road access is available. Unimproved roads (tracks) penetrate the area.

### Appearance

The majority of the RA appears as a continuous stand of beetle infested lodgepole pine. The entire area is quite common with respect to vegetation and landform.

### Surroundings

The RA is bounded on the west by Forest Road 370 and the Three Sisters Wilderness. This area is being used for dispersed recreation. This road is a low standard summer road and an established snowmobile route in winter.

The northeast corner is bounded by private land. These lands are being managed for timber production.

Forest lands to the south and east are being managed for wood and forage production. Logging activities prevail. Firewood cutting is also a common activity because it is in close proximity to Bend.

Triangle Butte to the east is being quarried for cinders. The haul route runs adjacent to the RA.

Forest Road 4601 runs adjacent to the south boundary. This is also a low standard road receiving moderate use.

There are three developed sites within 1.5 miles of the RA. These are Three Creeks Lake, Driftwood, and Three Creeks Horse Camp. Total use for these areas is 11,688 Recreation Visitor Days (RVD's).

### Attractions

The attractions within the RA include natural forests and limited wildlife.

Big game hunting and snowmobiling have been the primary use.

## CAPABILITY

### Manageability and Boundaries

The ability to manage an area as undeveloped must be considered before a recommendation can be made. Factors such as size, shape, and location are important.

The Forest roads around the area offer adequate opportunity for transportation access and traveler facilities such as trailheads. A trail system could be constructed.

Past experience has shown that low standard roads adjacent to undeveloped areas often require policing and signing in order to keep incompatible uses out.

It would be hard to manage the RA for primitive values because of its small size and roaded boundaries. The area is also easily accessible due to the flat ground and existing tracks.

Mountain pine beetle activity in the area may be setting the stage for a catastrophic fire.

The scarcity of water and landform diversity would make it difficult to attract people who are seeking an undeveloped recreation experience.

### Natural Integrity

The vast majority of the RA is in a natural state and unaffected by human influences.

Slash burning around the RA produces air pollution for short periods of time, but it has not affected natural processes within the RA.

The firewood cutting has affected the natural processes along the fringes. Time would eventually restore natural processes.

The natural processes have been most heavily affected by the suppression of wildfire in the area. The ecology and natural succession have been altered by the exclusion of fire.

### Apparent Naturalness

Of the human-caused effects discussed in the previous section, the firewood cutting would have the greatest influence upon the apparent naturalness as perceived by the user. Woodcutting is confined to the perimeter of the area, affecting 20 to 40 percent of the RA.

### Opportunities for Solitude

The opportunity for solitude considers the following factors: size of area, topographic screening, vegetative screening, distance from perimeter to core, and human intrusions. Overall, there is a moderate opportunity for solitude.

## Primitive (ROS) Recreation Opportunities

Solitude and the following additional factors are used for rating primitive recreation: diversity of opportunities, challenge, and absence of facilities. Overall, there is a low opportunity for primitive recreation.

Existing opportunities include hiking, hunting, backpacking, camping, ski touring, horseback riding, photography, nature study, and acquiring general knowledge and understanding.

## Challenging Experiences

This attribute is rated as to the RA's ability to offer opportunities for unusual adventure, excitement, challenge, self-reliance, initiative, and judgment. Challenging features include dangerous animals, climatic disturbance, avalanche potential, terrain features (i.e., cliffs, quicksand, sink holes), fast-moving water, glaciers, and a lack of dominant visual features on which to orient oneself. Hazardous features are seldom encountered in this area.

## Special Features

No threatened, endangered, or sensitive species (plant, animal, or insect) known to exist in the RA. No known cultural resources are located in the RA.

## Historic and Scientific Study

The RA receives an "infrequent" rating for its geological and ecological features. This rating is given to features found throughout the High Cascade physiographic province.

## Availability and Resource Potentials

Refer to Table C-1.

## Management Considerations

The mountain pine beetle infestation is at, or near, epidemic levels in lodgepole pine communities on the Forest. Entomologists predict that this epidemic will continue for another 10 to 15 years until the beetles' major food supply of lodgepole pine is either consumed or destroyed. In this area, the infestation may be setting the stage for a catastrophic fire.

NEED

## Nearby Wilderness and Its Use

The Three Sisters Wilderness (94,247 acres on Deschutes National Forest) is the nearest Wilderness and is located just west of the RA. It is currently being used at about 35 percent of capacity.

Statistics for fiscal year 1983 indicate use for the Deschutes portion of the Three Sisters Wilderness was 48,900 RVD's.[2] About 30 percent of the use came from the local area, about 55 percent from other in-state locations, and about 15 percent from out of State.[3]

Deschutes County, which had a population of 63,300 in 1983, represents the majority of the Forest Influence Area.

Distance from Population Centers

The Forest Influence Area includes the following towns: Sisters, Redmond, Tumalo, Bend, Sunriver, LaPine, Crescent, and Gilchrist. All of these are within 100 miles of the Three Sisters Wilderness. Bend, with the largest population (17,840), is 25 miles from the Wilderness by road. This distance is not excessive for people interested in an undeveloped recreation experience.

Ecosystem Representation

No rare or unique ecosystems are known to exist within the RA.

Congressional and Proponent Interest

The RA has received very little interest by wilderness proponents and none by Congress.

Public Input

The RARE II evaluation process showed that 2 percent of the respondents wanted wilderness designation, 27 percent preferred a nonwilderness designation, and 71 percent wanted further planning.

Other Public Scoping Results

Two public workshops on Roadless Areas were conducted in early 1984. Public comments on Roadless Areas were also requested through the "Forest Plan Report." There was only limited concern and that concern was split between retaining the area as undeveloped and developing it.

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[2] 1983 RIM Data.

[3] This data based on analysis of 1981 Wilderness permits for the Three Sisters Wilderness.

# BEND WATERSHED ROADLESS AREA
## (RARE NO. 06194)

## DESCRIPTION - THE EXISTING CONDITION

### History

The Bend Watershed Roadless Area (RA) was included in both the RARE I and RARE II analysis processes. Some boundaries have changed since 1979. Along the western fringe two boundary adjustments were made to exclude the Mount Bachelor Ski Area water system, powerline, and associated roads, and a short section of road that was inadvertently included in the initial inventory. Along the western fringe, logging activities near Farwell Spring and those associated with the 1979 Bridge Creek Fire Salvage Sale, and a small roaded area along the southern boundary were also excluded. These areas were excluded because the logging and other human developments were inconsistent with Roadless Area values.

### Location and Access

The Bend Watershed RA contains 14,250 acres and lies within the following townships:

T. 17 S., R. 9 E., W.M.
T. 18 S., R. 9 E., W.M.
T. 17 S., R. 10 E., W.M.
T. 18 S., R. 10 E., W.M.

The area is located on the east flank of the Cascades at the head of Tumalo Creek drainage on the Bend District of the Deschutes National Forest, Deschutes County, Oregon.

The area is reached by traveling west from Bend, Oregon, on County Road 4601 for 14 miles and by Highway 46 (Century Drive).

Approximately 14 miles of trail exist within the RA. Trails 23, 24, 25, and 26 pass through the area. In addition, there are 16 miles of cross-country ski and snowmobile trails.

### Geography and Topography

The topography of the RA is extremely variable, ranging from steep to gentle buttes and drainage systems. Principal features within the area include Tumalo Mountain, Swampy Lakes, Bridge Creek, and Tumalo Creek.

Elevation ranges from 7775 feet on Tumalo Mountain to 5000 feet near Tumalo Falls.

Precipitation ranges from 30 to 45 inches per year and falls primarily in the form of snow. The porous volcanic soils absorbs moisture directly into the ground. The area is drained by tributaries of Tumalo Creek.

## Soil Types

The soil types described[1] here are based on the Deschutes National Forest Soil Resource Inventory.

The soils are the high elevation types composed of a shallow layer of light brown, sandy Mazama ash over stony glacial till. A bleached gray soil occurs in mountain hemlock stands; otherwise, soils are moderately deep, light brown, and sandy in texture and excessively drained, or shallow soils lying atop bedrock lava. In some areas, a coarse pumice from Devils Hill or Rock Mesa occurs on the surface.

| Land Type | Landform | Percent Slope | Elevation |
|---|---|---|---|
| 4 | Alpine Meadows | <30 | ---- |
| 11 | Lava Flows | 0-30 | 4500-7000 |
| 12 | Talus Slopes | 20-70 | 4500-7000 |
| 16 | Sloping Uneven Glaciated Uplands | 15-40 | 4300-6500 |
| 17 | Gentle Uneven Glaciated Uplands | 0-30 | 4200-6500 |
| 18 | Glaciated Valley Walls and Cirques | 30-80 | 4200-6600 |
| 19 | Glaciated Uplands | <20 | 4700-6000 |
| 20 | Glaciated Uplands with Many Lakes | 0-30 | 5300-6000 |
| 22 | Glacial Moraines and Valley Walls | 25-60 | 3300-5700 |
| 24 | Glacial Moraines and Sideslopes | 20-60 | 3600-4300 |
| 25 | Uneven Glaciated Lands | 10-40 | 4400-5400 |
| 73 | Uneven Lava Plains | <15 | 4800-5800 |
| 84 | Dissected Sideslopes | 30-80 | 6000-7000 |
| 85 | Ridge Tops and Flats | 0-30 | 6000-6800 |

## Vegetation

Plant communities present are: mountain hemlock/grouse huckleberry, lodgepole pine/grouse huckleberry, mixed conifer/manzanita, lodgepole pine/manzanita, mixed conifer/snowbrush/sedge, lodgepole pine/sedge-lupine penstemon, lodgepole pine/sedge-lupine, ponderosa pine/bitterbrush-snowbrush/sedge, and wet meadows.

The mountain pine beetle infestation has reached epidemic proportions in lodgepole pine stands.

## Ecosystem Type

This RA is composed of mixed conifer and mountain hemlock forest. Lodgepole pine forest accounts for less than 5 percent of the RA. Equivalent amounts of "old growth", "mature", and "young" forest successional stages are represented, most of which is "old growth" mountain hemlock. Less than 5 percent of the RA is classified as nonforest where trees are widely scattered or nonexistent. Nonforested areas are either high-elevation, openings with few trees and minimal ground vegetation in coarse pumice located north and west of Tumalo Mountain, or moist meadows in the Bridge Creek and Tumalo Creek drainages. A very small amount of talus slope is found on Tumalo Mountain, providing habitat for dependent wildlife such as the pika and yellow-bellied marmot.

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[1] Daniel H. Larsen, Soil Resource Inventory, Deschutes National Forest, Pacific Northwest Region, 1976.

Riparian ecosystems in the Bridge Creek drainage occur along Bridge Creek (4.10 miles) and Spring Creek (1.20 miles). Bridge Creek is dominated by spruce and a grass/forb understory. Bridge Creek narrows from 5 to 10 feet wide near its headwaters. No willows or other shrubs are present. The Spring Creek zone is narrow (≤ 5 feet), grass/forb under mountain hemlock/red fir forest communities. The first 1/4 mile of this riparian ecosystem was burned during the Bridge Creek fire in July of 1979.

Riparian ecosystems in the Tumalo Creek drainage are more extensive. Along Tumalo Creek (1.75 miles) riparian habitat is a narrow (5-10 feet wide) spruce/mountain hemlock forest mixed with alder. Bottle Creek and Rock Creek also have narrow riparian ecosystems, but lack alder. The North Fork Tumalo Creek (1.00 miles) riparian ecosystem is narrow (0 to 10 feet wide) spruce-dominated forest with grass/forb understory. The Middle Fork Tumalo Creek riparian ecosystem has extensive sedge-dominated meadows which is 1,000 feet wide that create an excellent mosaic of forest-to-meadow "edge", and provide habitat for many wildlife species. South Fork Tumalo Creek (2.25 miles) is another narrow (5-10 feet wide) riparian ecosystem of spruce draining Swampy Lakes. Swampy Lakes is a 40-plus acre wet meadow containing several shallow ponds ranging from 1/4 to 3/4 acre in size.

Mule deer belonging to the Upper Deschutes Management Unit herd summer in this RA. Although there is a limited amount of early seral habitat for deer the riparian ecosystems are excellent fawn-rearing sites.

An estimated 25 to 70 Roosevelt elk use this area during the summer and fall. The riparian ecosystems and associated thermal cover, combined with the isolation from human disturbance, make this area a valuable calf-rearing site. The area is becoming more popular for archery elk hunting each year. These elk are thought to either migrate over the Cascade Crest to winter grounds on the Willamette National Forest, or winter along the Deschutes River near Ryan Ranch and vicinity.

No Endangered, Threatened, or Sensitive species of animals or plants are known or suspected in this RA. However, no formal plant surveys have been attempted in recent years.

Tum Lake is the only lake present and supports no fishery.

Bridge Creek has a limited population of rainbow trout on its lower reaches in the RA. The upper reaches support no fish, apparently due to steep gradient (12 percent) and few pools. Spring Creek is too small (2 feet wide), cold, steep (8 percent), and lacks pools which support a fishery.

The Tumalo Creek system also has a relatively limited fishery. Brook trout are present in all tributaries except Bottle Creek and Rock Creek. Steep gradients and low water temperatures contribute to the absence of fish in these two channels.

Tumalo Creek and its north and middle tributaries have limited populations of brook trout, few pools, and poor habitat for a fishery.

The RA receives minimal fishing pressure except in the vicinity of Tumalo Falls and areas further downstream.

## Current Uses

The RA is inventoried as Recreation Opportunity Spectrum (ROS) category "Semiprimitive Nonmotorized." Primary recreation uses are hiking, horseback riding, hunting, picnicking, dispersed camping, cross-country skiing, and snowmobiling. Use statistics for 1983 indicate 330 Recreation Visitor Days (RVD's) for hiking, 200 RVD's for horseback riding, 1,600 RVD's for hunting, 220 RVD's for picnicking, 200 RVD's for dispersed camping, 13,600 for cross-country skiing, and 2,400 RVD's for snowmobiling. Three primitive shelters accommodate the cross-country skiers.

Since 1926 the majority of the area has been devoted to the Bend Municipal Watershed Management. The City of Bend has the exclusive authority by formal cooperative agreement signed by the Chief of the Forest Service to manage th watershed. Bridge Creek is the main water supply for the city of Bend. A small diversion dam was constructed on the middle fork of Tumalo Creek and a connecting ditch has been built between the dam and Bridge Creek. A low standard road off Forest Road 370 accesses the area.

The Bridge Creek Burn of 1979 devastated much of the area around Bridge Creek and Tumalo Creek. Some salvage logging by helicopter and planting and rehabilitation projects have been carried out in the area.

Outfitter guides operate within the RA under the authority of special-use permits.

Firewood cutting is permitted in those areas where roads run adjacent to the RA.

## Appearance

The appearance of the RA varies considerably depending upon location. At lower elevations, the lodgepole communities are dense and beetle infested. Consequently, fuel loading is high and many of the trees are dead or dying. Virgin stands of hemlock, true fir, and spruce are found at higher elevations along the streams. The RA has good diversity of vegetation and topography, cascading streams, springs, and meadows. The Bridge Creek Burn has heavily affected the visual quality, particularly from the ridgetops overlooking the drainage.

## Surroundings

To the north and east much of the land has been affected by logging activities and Bridge Creek Burn rehabilitation projects.

The RA is bounded to the south by County Route 46 (the Cascade Lakes Highway). This highway receives intensive year-round recreation use by skiers and summer tourists.

The RA is bounded on the northeast by Forest Road 370. This low standard jeep road is a snowmobile trail during the winter. Lands west of Forest Road 370 are primarily in the Three Sisters Wilderness.

The RA is bounded on the north by Forest Road 4601. This is a low standard road which is used for firewood cutting and logging. The Bearwallow RA lies just north of Forest Road 4601.

Tumalo Falls to the west is a popular place for tourists during the summer, with use totalling 300 RVD's during FY 1983.

Most of the facilities associated with the Bend Municipal Water System, including the caretaker's house, are located near Tumalo Falls.

Geothermal lease applications have been filed for on lands along the western boundary.

The Tumalo Irrigation District has a constructed ditch that approaches the western boundary near Tum Lake.

### Attractions

The major attractions within the RA include the cascading streams, springs, meadows, virgin forest, scenery, wildlife, and varied terrain.

The summit of Tumalo Mountain offers panoramic views of the Cascades and surrounding lands.

Easy access and excellent snow depth makes the area attractive to winter users.

## CAPABILITY

### Manageability and Boundaries

The ability to manage an area as undeveloped must be considered. Factors such as size, shape, and location are important.

The low standard roads along the northern and western boundaries affect the manageability in both positive and negative ways. The roads provide adequate opportunity for transportation access and trailheads. However, jeep roads adjacent to undeveloped areas often require policing and signing in order to keep out motorized uses where not permitted.

The Cascade Lakes Highway will affect the manageability of the southern portion. Traffic noise would detract from undeveloped recreation experience. The snowmobile traffic on Forest Road 370 would detract in a similar way.

The RA is large enough to be managed as unroaded, but the boundaries are irregular and do not follow clear topographic or geographic lines.

The current trail system adequately serves the area.

The area would be difficult to manage for a primitive experience because of the large number and varying types of users within the area.

The mountain pine beetle epidemic is increasing the potential for a catastrophic fire. Undeveloped designation might preclude treating these fuels (reducing the hazard) by normal methods.

## Natural Integrity

The majority of the RA is in a natural state and unaffected by human influences.

The trail systems are extensive and their effect upon the immediate area is high. The total area involved is insiginificant.

Physical developments in the area include the three trail shelters and the municipal water system.

Slash burning around the RA produces air pollution for short periods of time, but it has not affected natural processes within the RA.

Several undeveloped campsites are located along the streams in the RA.

Natural processes have been most heavily affected by the control of wildfire in the area. Prescribed burning could restore the natural processes.

## Apparent Naturalness

The trails, shelters, water system development, and undeveloped campsites have the greatest influence on the apparent naturalness as perceived by the user. Overall, their influences on the naturalness of the area are low.

## Opportunities for Solitude

The opportunity for solitude is based on the following factors: size of area, topographic screening, vegetative screening, distance from perimeter to core, and human intrusions. The overall opportunity for solitude is moderate except in areas adjacent to the Cascade Lakes Highway.

## Primitive Recreation Opportunities

Solitude and the following additional factors are used for rating primitive recreation experience: diversity of opportunities, challenge and absence of facilities. Overall, the opportunity for primitive recreation is high.

## Challenging Experiences

A challenging experience is based on an area's ability to offer opportunities for unusual adventure, excitement, challenge, self-reliance, initiative, and judgment. Challenging features include dangerous animals, climatic disturbance, avalanche potential, terrain features (i.e., cliffs, quicksand, sink holes), fast-moving water, glaciers, and a lack of dominant visual features on which to orient oneself. Only a few hazardous features are present in the RA.

## Special Features

No known habitats for Threatened, Endangered, or Sensitive species exist in the area.

### Historic and Scientific Study

The RA receives an "outstanding" rating because of its geological, ecological, and cultural features not found elsewhere in the area.

Historical features included in this rating are the Tumalo Irrigation System (Crater Ditch), the Bend Municipal Water Supply water intake structures, and possibly the old Tumalo Lookout and the Swampy Lakes Shelter.

The spring at the head of Bridge Creek is a special geological feature.

### Availability and Resource Potentials

Refer to Table C-1.

### Management Considerations

The mountain pine beetles infestation in lodgepole pine stands has reached epidemic proportions on the Forest. Entomologists predict that this epidemic will continue for another 10 to 15 years until the beetle's major food supply of lodgepole pine is either consumed or destroyed. In Roadless Areas, the pine beetle epidemic may set the stage for a catastrophic fire.

NEED

### Nearby Wilderness and Its Use

The Three Sisters Wilderness (94,247 acres on the Deschutes National Forest) is the nearest Wilderness and is located 2 miles to the north. It is currently being used at about 35 percent of capacity.

Statistics for fiscal year 1983 indicate use for the Three Sisters Wilderness was 48,900 RVD's.[2] About 30 percent of the use came from the local area, about 55 percent from other in-State locations, and about 15 percent from out of State.[3]

Deschutes County, which had a population of 63,300 in 1983, represents the majority of the Forest Influence Area.

### Distance from Population Centers

The Forest Influence Area includes the following towns: Sisters, Redmond, Tumalo, Bend, Sunriver, LaPine, Crescent, and Gilchrist. All of these are within 100 miles of the Wilderness. Bend, with the largest population (17,840) is 25 miles from the Wilderness by road which is not excessive for people interested in an undeveloped recreation experience.

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[2] 1983 RIM Data.

[3] This data based on analysis of 1981 Wilderness permits for the Three Sisters Wilderness area.

### Ecosystem Representation

No rare or unique ecosystems are known to exist within the RA.

### Congressional and Proponent Interest

A local group has expressed an interest in closing Forest Road 370 and adding the RA to the Three Sisters Wilderness. However, this proposal did not arise again during public comments on Roadless Areas in 1984.

### Public Input

The RARE II evaluation process showed that 73 percent of the respondents wanted a wilderness designation, 27 percent wanted a nonwilderness designation, and 71 percent wanted it to be considered for further planning.

### Other Public Scoping Results

Two public workshops were conducted during early 1984. Public comments were also requested through the "Forest Plan Report." Public comment primarily was heavy to protecting the area and keeping it undeveloped but some comments favored development of the area.

## AVAILABILITY

### Resource Potentials

The lands along the Cascade Crest are of interest as a possible source of geothermal steam energy. Although the potential developable geothermal energy ranges from approximately 20 to 70 kilowatts per acre, no valid leases have been filed for the area.

# CHARLTON ROADLESS AREA
# (RARE NO. 06107)

## DESCRIPTION - THE EXISTING CONDITION

### History

The Charlton Roadless Area (RA) was included in the RARE I and RARE II analysis processes. Some boundaries have changed since 1979. The eastern boundary was adjusted to exclude two logged areas. This portion was excluded based on the premise that logging activities are inconsistent with Roadless Area values.

### Location and Access

The Charlton RA contains 7,243 acres and lies within the following townships:

T. 20 S., R. 6 E., W.M.
T. 20 S., R. 7 E., W.M.
T. 21 S., R. 6 E., W.M.
T. 21 S., R. 7 E., W.M.

The general location is on the eastern slope of the Cascade Summit north of Forest Road 5897 and south of Forest Road 60 in the Bend District of the Deschutes National Forest, Deschutes County, Oregon.

Access is gained by traveling west from Bend, Oregon, on Highway 46 for 52 miles. Turn right on Forest Road 5897 for 4 miles.

Approximately 9 miles of trail are located within the RA. The following trails pass through the area: No. 21, No. 19, and the Pacific Crest Trail.

### Geography and Topography

The topography of this RA is gently rolling and slopes to the east and west from the Cascade Crest, with the exception of Charlton Butte. The principal features in the area are Charlton Butte and Lemish and Taylor Lakes. Several smaller lakes are scattered throughout the area.

The elevation ranges from 6500 on Charlton Butte to 5000 feet in the northeastern portion.

Precipitation ranges from 27 to 35 inches per year and falls primarily in the form of snow. It is usually late June or July before the snow melts out. The porous volcanic soils causes the moisture to soak directly into the ground. Very little runoff occurs. A few wet meadows (old lake beds) are located throughout the area.

### Soil Types

The soil types described here are based on the Deschutes National Forest Soil Resource Inventory.[1]

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[1] Daniel H. Larsen, Soil Resource Inventory, Deschutes National Forest, Pacific Northwest Region, 1976.

The soils are the high elevation types consisting of a shallow to moderately deep, sandy brown Mazama ash over stony glacial till, scoured bedrock, talus or cinders. A bleached gray layer occurs within the surface horizon under mountain hemlock. Bare rock outcrops are common on the steeper slopes.

| Land Type | Landform | Percent Slope | Elevation |
|---|---|---|---|
| 16 | Sloping Uneven Glaciated Uplands | 15-40 | 4300-6500 |
| 17 | Gentle Uneven Glaciated Uplands | 0-30 | 4200-6500 |
| 83 | Cinder Cones | 25-70 | 5700-6800 |
| 85 | Ridgetops and Flats | 0-30 | 6000-6800 |

## Vegetation

Plant communities present are: mountain hemlock/grouse huckleberry, lodgepole/grouse huckleberry, lodgepole/sedge-lupine-penstemon, lodgepole/sedge-lupine, lodgepole/lupine needlegrass, lodgepole/eianthastrum/needlegrass-lupine, mixed conifer/snowbrush-sedge, mixed conifer/manzanita, lodgepole/manzanita, and wet meadows.

Most of the lodgepole pine communities are infested by the mountain pine beetle to epidemic proportions.

## Ecosystem Type

Approximately 75 percent of this RA is classified as mountain hemlock forest. The eastern 25 percent is lodgepole pine forest. Small inclusions of mixed conifer forest are also present. These forests are classified as either being "old growth" or "mature" successional stages. A small amount of "young" forest is found at the southesast corner of this RA.

Riparian ecosystems are found on the margins of the lakes and ponds. These communities are narrow in width (<20 feet). Charlton Creek also has very narrow riparian communities along its banks. Predominantly forested, these zones occasionally widen into open meadows as large as 10 acres and more (e.g., Clover Meadow).

The variety of wildlife species is typical of mature and overmature high elevation forest. A scarcity of early seral plant communities accounts for a Proportionate low representation by such species as the mountain bluebird.

Mule deer belonging to the Upper Deschutes Herd Management Unit summer in this RA. Because most of this RA is mature/overmature forest, deer use is light.

An estimated 20 to 40 Roosevelt elk use the riparian communities along Charlton Creek and Clover Meadow as summer and fall range. Wile it has not been confirmed, it is suspected that these elk winter on the west slope of the Cascades in the Willamette National Forest. Elk inhabit these riparian areas during the archery hunting season, and are favorite hunting sites.

No Endangered, Threatened, or Sensitive species are known or suspected to occur within the RA but no special surveys for plants have been initiated.

**The RA contains four fish-producing lakes--Blowdown, Lemish, Lily, and Taylor. Taylor Lake, located on the north edge of the RA, is accessible by vehicles. Blowdown Lake is the smallest of the four at 4 acres, followed by Lily Lake at 15 acres, Lemish Lake at 16 acres, and Taylor Lake at 40 acres. Lily Lake is deep (at 44 feet) when compared to 8 and 13 foot depths of the other three. All are stocked with brook trout.**

Charlton Creek does not support a fisheries because of its ephemeral stream flow.

### Current Uses

The RA's primary use is dispersed recreation. The Recreation Opportunity Spectrum (ROS) inventoried category is "Primitive". Recreation uses are hiking, horseback riding, hunting, fishing, and dispersed camping. Use statistics for fiscal year 1983 indicate approximately 500 Recreation Visitor Days (RVD's) for hiking, 100 RVD's for horseback riding, 100 RVD's for hunting, and 600 RVD's for dispersed camping.

Geothermal lease applications have been filed on 2,500 acres in the RA.

The Soil Conservation Service maintains a snow measurement site near Blowdown Lake. On-site facilities include a rain gauge, snow pillow, radio station, access road, and building.

The Bend District has four designated helispots within the RA. These are natural openings (meadows) and no maintenance or vegetative clearing are required.

### Appearance

The RA appears as a densely forested area on gently rolling terrain. Charlton Butte is the only dominant landform.

The mountain pine beetle has infested the lodgepole pine stands. The trees turn red and die which affects scenic quality.

### Surroundings

The area is bounded on the west by the Willamette portion of the RA. The primary use has been dispersed recreation. The Pacific Crest Trail passes through the area.

The RA is bounded to the north by Forest Road 600. This is a low standard road which separates the Charlton RA from the Three Sisters Wilderness. It receives some winter use by snowmobilers but use at all times is low.

The RA is bounded on the south by Forest Road 5897. This is a wide road roadbed, whose maintenance standard is low. It is also the northern boundary of the Maiden Peak RA. Some winter snowmobiling occurs but overall use is low.

Lands to the east of the RA are managed primarily for wood and forage production. Logging is prevalent.

## Attractions

Major attractions within the RA include small lakes, virgin forest, meadows, scenery, and wildlife.

The summit of Charlton Butte offers views of the surrounding lands.

## CAPABIITY

## Manageability and Boundaries

The ability to manage an area as undeveloped must be considered. Factors such as size, shape, and location are important.

Low standard roads adjacent to the boundaries affects the manageability in both positive and negative ways. The roads provide adequate opportunity for transportation access and trailheads. Conversely, this type of road often requires policing and signing in order to control incompatible uses.

The eastern boundary is somewhat irregular and does not follow clear topographic or geographic breaks but some improvement was made when the boundary was adjusted in 1983.

The mountain pine beetle infestation may be setting the stage for a catastrophic fire.

The existing trail system adequately serves the area.

## Natural Integrity

The vast majority of the RA is in a natural state and unaffected by human influences.

The trail systems are fairly extensive and their effect upon the area immediately surrounding the trails is high. Their overall impact is insignificant.

Slash burning around the RA produces air pollution for short periods of time, but it has not affected natural processes within the RA.

There are several undeveloped campsites on the lakes. The planting of fish has disrupted the natural processes in most of the lakes.

Natural processs have been most heavily affected by the suppression of wildfire. The ecology and natural succession have been altered by the exclusion of fire. Time and prescribed burning could restore the natural processes.

The snow survey station has altered the natural processes in its immediate vicinity.

## Apparent Naturalness

Of the human-caused effects discussed in the previous section, the trails, undeveloped campsites, and snow survey station have the greatest influence on the apparent naturalness as perceived by the user, but, overall, this influence is minimal.

## Opportunities for Solitude

The opportunity for solitude considers the following factors: size of area, topographic screening, vegetative screening, distance from perimeter to core, and human intrusions. Overall, there is a moderate opportunity for solitude.

## Primitive Recreation Opportunities

Solitude and the following additional factors are used for rating primitive recreation: diversity of opportunities, challenge and absence of facilities. Overall, there is a moderate opportunity for Primitive Recreation in the RA.

Existing opportunities include hiking, hunting, fishing, nonmotorized watercraft use, swimming, backpacking, camping, ski touring, horseback riding, photography, nature study, and acquiring general knowledge and understanding.

## Challenging Experiences

This attribute considers the area's ability to offer opportunities for unusual adventure, excitement, challenge, self-reliance, initiative, and judgment. Challenging features include dangerous animals, climatic disturbance, avalanche potential, terrain features (i.e., cliffs, quicksand, sink holes, fast-moving water, glaciers, and a lack of dominant visual features on which to orient oneself. Since such hazardous features are seldom encountered, challenging experiences are rare.

## Special Features

No Endangered, Threatened, or Sensitive wildlife or plant species are known to inhabit the area.

## Historic and Scientific Study

The Deschutes portion of the RA receives an "infrequent" rating for the geological and ecological features present. This rating is given to features often found in the High Cascade physiographic province.

## Availability and Resource Potentials

Refer to Table C-1.

## Management Considerations

The mountain pine beetle has infested lodgepole pine stands at, or near, epidemic levels on the Forest. Entomologists predict the epidemic will continue for another 10 to 15 years until the beetle's major food supply of lodgepole pine is either consumed or destroyed. In roadless areas, this activity may be setting the stage for a catastrophic fire.

## NEED

### Nearby Wilderness and Its Use

The Three Sisters Wilderness (94,247 acres on Deschutes National Forest) is the nearest Wilderness and is located immediately to the north. It is currently being used at about 35 percent capacity.

Statistics for fiscal year 1983 indicate use for the Deschutes portion of the Three Sisters Wilderness was 48,900 RVD's.[2] About 30 percent of the use came from the local area, about 55 percent from other in-State locations, and about 15 percent from out of State.[3]

In considering local use, Deschutes County, which had a population of 63,300 in 1983, represents the majority of the Forest Influence Area.

### Distance From Population Centers

The Forest Influence Area includes the following towns: Sisters, Redmond, Tumalo, Bend, Sunriver, LaPine, Crescent, and Gilchrist. Bend, with the largest population (17,840), is 25 miles from the Wilderness by road, which is not excessive for people interested in a wilderness experience.

### Ecosystem Representation

No rare or unique ecosystems are known to exist within the RA.

### Congressional and Proponent Interest

Congressional input has shown no interest in the RA, and only minimal interest by wilderness proponents.

### Public Input

The RARE II evaluation process showed that 19 percent of the respondents wanted a wilderness designation, while 81 percent want a nonwilderness designation.

### Other Public Scoping Results

Two public workshops were held regarding Roadless Areas in early 1984. Public comments were also requested through the "Forest Plan Report." there was not much interest in the area and the few comments that were received were split between development and nondevelopment.

[2] 1983 RIM data.

[3] This data is based on analysis of 1981 Wilderness permits for the Three Sisters Wilderness Area.

# MAIDEN PEAK ROADLESS AREA
## (RARE NO. 06108)

## DESCRIPTION - THE EXISTING CONDITION

### History

The Maiden Peak Roadless Area (RA) was included in both the RARE I and RARE II analysis processes. Some boundaries have changed since 1979. Several developments and logged areas were inadvertently included within the RA during the initial inventory. The eastern boundary was adjusted to exclude several timber sales. A minor adjustment was made to exclude a portion of the powerline near Odell Lake. These areas were excluded because logging and other developments were inconsistent with Roadless Area values.

### Location and Access

The Deschutes portion of the Maiden Peak RA contains 27,008 acres and lies within the following townships:

T. 20 S., R. 6 E., W.M.
T. 20 S., R. 7 E., W.M.
T. 21 S., R. 6 E., W.M.
T. 21 S., R. 7 E., W.M.
T. 22 S., R. 6 E., W.M.
T. 22 S., R. 7 E., W.M.
T. 23 S., R. 6 E., W.M.
T. 23 S., R. 7 E., W.M.

The RA lies along the eastern slope of the Cascade Summit, north of State Highway 58 and south of Forest Road 5897 on the Bend and Crescent Districts of the Deschutes National Forest, Deschutes and Klamath Counties, Oregon.

Access is gained by traveling south from Bend, Oregon, on U.S. Highway 97 for 57 miles, then west on State Highway 58 for 20 miles, at which point Highway 58 parallels the RA.

Approximately 26 miles of trail are included within or adjacent to the RA. The major trails are: Numbers 41, 99, 19, and 21, and the Pacific Crest Trail.

### Geography and Topography

The RA is composed of gently rolling forest and steep mountains slope around Maiden Peak, the Twins, and Maklaks Mountain. Numerous small lakes and streams dot the landscape. Principal features are Maiden Peak, Bobby Lake, and Rosary Lakes.

Elevation ranges from 5000 feet near Odell Lake to 7878 feet at Maiden Peak.

Precipitation ranges from 40 to 60 inches per year and falls primarily in the form of snow. The area is usually snow-free by late June or early July.

The porous volcanic soils cause the moisture to soak directly into the ground. Wet meadows are scattered throughout the area.

## Soil Types

The soil types[1] are based on the Deschutes National Forest Soil Resource Inventory.

Soils are composed of shallow to moderately deep sandy Mazama ash and pumice lying atop stony glacial till or glacial scoured bedrock. Surface soils are sandy, light brown, and well drained. Subsoils are stony, and of mixed origin. A bleached gray soil occurs in the surface horizon under mountain hemlock stands. Bare talus and bedrock exposures are common on the steeper slopes.

| Land Type | Landform | Percent Slope | Elevation |
|---|---|---|---|
| 12 | Talus Slopes | 20-70 | |
| 16 | Sloping Uneven Glaciated Uplands | 15-40 | 4300-6500 |
| 17 | Gentle Uneven Glaciated Uplands | 0-30 | 4200-6500 |
| 84 | Dissected Sideslopes | 30-80 | 6000-7000 |
| 85 | Ridge Tops or Flats | 0-30 | 6000-6800 |
| 6H | Lava Plains or Butte Toeslopes | 0-30 | 5400-6000 |

## Vegetation

Plant communities present are: mountain hemlock/grouse huckleberry, lodgepole pine/grouse huckleberry, mixed conifer/manzanita, and lodgepole, lodgepole pine/sedge-lupine, lodgepole pine/sedge-needlegrass basins, lodgepole pine/sedge wetlands, lodgepole/lupine-needlegrass, mixed conifer/snowbrush-chinkapin, mixed conifer/snowbrush/sedge, and wet meadows.

The mountain pine beetle infestation has reached epidemic proportions in the lodgepole pine stands.

## Ecosystem Type

Mountain hemlock accounts for 80 percent of the forest while mixed conifer and lodgepole pine comprises the remaining. The forest is primarily in "mature" or "old growth" successional stages. Patches of "young" forest and some "early" successional stages are scattered throughout the southern half of the RA. Less than 2 percent of the area is classified as nonforested and occurs as small meadows or cinder cones. Small water-filled potholes are widely spaced throughout the area.

Riparian ecosystems include the scattered meadows and forested streambanks along Charlton and Moore Creeks.

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[1] Daniel H. Larsen, Soil Resource Inventory, Deschutes National Forest, Pacific Northwest Region, 1976.

Mule deer belonging to the Upper Deschutes Herd summer in the area. Deer density is low because the mountain hemlock forest is of low forage productivity. Small family groups of Roosevelt elk also use the area as summer range. Most of this use occurs in the riparian communities along Moore and Charlton Creeks.

Fish are present in nine lakes. The lakes vary from 6 to 200 acres in size and are fairly deep. Most support populations of brook trout, though Charlton and Moore Creeks do not support any fish populations.

## Current Uses

The RA is currently used for Dispersed Recreation. The Recreation Opportunity Spectrum (ROS) inventory classifies the area as "Primitive", although Charlton Lake is classified "Semiprimitive Nonmotorized". Recreation includes hiking, horseback riding, dispersed camping, hunting, fishing, and cross-country skiing. Use statistics for fiscal year 1983 show 600 Recreation Visitor Days (RVD's) for hiking, 200 RVD's for horseback riding, 200 RVD's for hunting, 700 RVD's for camping, and 300 RVD's for cross-country skiing.

Six helispots are designated in the RA and comprise natural openings where no clearing is necessary.

A water diversion located on Charlton Lake serves as the water source for the Waldo Lake campgrounds.

## Appearance

The RA is mainly flat country with dense, virgin, and often beetle-infested forests. Small lakes, streams, and meadows add variety. Maiden Peak is the most outstanding landform.

## Surroundings

The RA is bounded on the west by the Willamette portion of the Maiden Peak RA. These lands are currently being used for dispersed recreation.

To the north, the RA is bounded by Forest Road 5897 and the Charlton RA. This is a low standard road receiving little use except for some snowmobiling during winter.

Lands to the east are used for wood and forage production. Logging is prevalent.

To the south, the RA is bounded by Highway 58 and Odell Lake. Recreation use totaled 90,375 RVD's for developed sites around Odell Lake during FY 1983. Five campgrounds, 2 picnic sites, 64 summer homes, and 2 resorts are near the Lake. Highway 58 is a major route across the mountains to the Willamette Valley.

Geothermal lease applications have been filed for in the northern portion of the RA.

## Attractions

Principal attractions within the RA include the numerous small lakes and streams, meadows, scenery, and wildlife. Of these lakes, Bobby and Rosary Lakes attract the most use. The summit of Maiden Peak and the Twins offer panoramic views of the surrounding region.

## CAPABILITY

### Manageability and Boundaries

The ability to manage an area as roadless must be considered before a recommendation can be made. Factors such as size, shape, and location are important.

The intensive recreational development around Odell Lake will affect the south portion of the RA. Noise created by motorboats and the high level of activity would detract from undeveloped recreation experience. The heavy traffic and resulting noise on Highway 58 would also detract from an undeveloped recreation experience.

Various roads along the boundaries affect the manageability in both positive and negative ways. They provide adequate opportunity for transportation access and trailheads but roads adjacent to Wilderness may also require policing and signing in order to keep out motorized vehicles.

The eastern boundary presents a problem because it is irregular and does not follow clear topographic or geographic breaks. Extensive signing would be required in order to identify the boundary.

The mountain pine beetle infestation is increasing the potential for a catastrophic fire in some of the area.

### Natural Integrity

The vast majority of the RA is in a natural state and unaffected by human influences.

The trail system is fairly extensive and its impact upon areas adjacent to the trail is high. The impact is insignificant in areas away from the trails.

Slash burning around the RA produces some air pollution for short periods of time, but it has not affected natural processes within the RA. Several undeveloped campsites are located on the lakes. Fish planting has disrupted the natural processes in most of the lakes.

Natural processes have been most heavily affected by the suppression of wildfire in the area.

The water diversion on Charlton Lake has had minor effects upon natural processes. The water diversion is not apparent to most visitors and the lake is not subject to drawdown at current use levels.

## Apparent Naturalness

Of the human-caused effects discussed earlier, the trails and undeveloped campsites have the greatest influence on the apparent naturalness as perceived by the user. Overall, their influences have had a negligible effect on the naturalness.

## Opportunities for Solitude

The opportunity for solitude is based on the following factors: size of area, topographic screening, vegetative screening, distance from perimeter to core, and human intrusions. Overall, the opportunity for solitude in the RA is moderate.

## Primitive Recreation Opportunities

Solitude and the following other factors are used for rating a primitive recreation experience: diversity of opportunities, challenge and absence of facilities. The opportunity for primitive recreation in this RA is low.

Existing opportunities include hiking, hunting, fishing, nonmotorized watercraft use, swimming, backpacking, camping, ski touring, horseback riding, photography, nature study, and acquiring general knowledge and understanding.

## Challenging Experiences

This attribute considers the RA's ability to offer opportunities for unusual adventure, excitement, challenge, self-reliance, initiative, and judgment. Challenging features such as dangerous animals, climatic disturbance, avalanche potential, terrain features (i.e., cliffs, quicksand, sink holes), fast-moving water, glaciers, and a lack of dominant visual features on which to orient oneself. Hazardous features are seldom encountered in the area.

## Special Features

No threatened or endangered species are known in the area. Jepson's monkey-flower (Mimulus jepsonii), a sensitive plant species, is suspected to occur because specimens have been found just outside the area. The area is suitable habitat for wolverine.

## Historic and Scientific Study

The Deschutes portion of the RA receives an "infrequent" rating for the geological and ecological features present. This rating is given to features often found in the High Cascade physiographic province.

## Availability and Resource Potentials

Refer to Table C-1.

## Management Considerations

The mountain pine beetle infestation has reached epidemic proportions in lodgepole pine stands. Entomologists predict this epidemic will continue for another 10 to 15 years until the beetle's major food supply of lodgepole pine is either consumed or destroyed. In Roadless Areas, this activity may be setting the stage for a catastrophic fire.

As of March 1985 there was a pending decision regarding use of 7 acres to be included in the Willamette Pass Ski Area.

## NEED

## Nearby Wilderness and Its Use

The Diamond Peak Wilderness Area is located one mile to the south (34,000 acres on Deschutes National Forest) is the nearest wilderness area. It is currently being used at about 7 percent capacity.

Statistics for fiscal year 1983 indicate use for the Deschutes portion of the Diamond Peak Wilderness area was 3,400 RVD's.[2] About 30 percent of the use came from the local area, about 55 percent from other in-state locations, and about 15 percent from out of State.[3]

About 65 percent of the visitors came from the Willamette Valley.

## Distance from Population Centers

The city of Eugene is about 100 miles from the Wilderness. Towns east of the Cascades and in the Forest Influence Area are: Sisters, Redmond, Tumalo, Bend, Sunriver, LaPine, Crescent, and Gilchrist. All of these are within 75 miles of the Wilderness. Bend is 50 miles from the Wilderness by road. These distances are not excessive for people interested in a wilderness experience.

## Ecosystem Representation

No rare or unique ecoystems are known to exist within the RA.

## Congressional and Proponent Interest

There has been no congressional interest in the RA, although one special interest group has indicated some concern.

## Public Input

The RARE II evaluation process showed that 19 percent of the respondents wanted wilderness designation, while 81 percent wanted a nonwilderness designation.

[2] 1983 RIM Data.

[3] This data based on analysis of 1983 wilderness permits for the Three Sisters Wilderness.

## Other Public Scoping Results

Two public workshops were held to discuss Roadless Area in 1984. Public comments were also requested through the "Forest Plan Report." The public comments indicate the greatest concern is for areas along the Crest of the Cascade Mountains. Many comments recommended not developing this part, but, overall, the comments were split regarding development.

# METOLIUS BREAKS ROADLESS AREA
## (RARE NO. 06191)

## DESCRIPTION - THE EXISTING CONDITION

### History

The Metolius Breaks Roadless Area (RA) was included in both the RARE I and RARE II analysis processes. Some boundaries have changed since 1979. Several small logged areas and the associated roads were inadvertently included within the RA during the initial inventory. The boundary was adjusted to exclude these developed areas from the RA because such logging activities are inconsistent with Roadless Area Values.

### Location and Access

The Metolius Breaks RA contains 10,907 acres and lies within portions of the following townships:

T. 10 S., R. 10 E., W.M.
T. 11 S., R. 9 E., W.M.
T. 11 S., R. 10 E., W.M.
T. 11 S., R. 11 E., W.M.

This RA is located about 6 miles east of the Mt. Jefferson Wilderness Area in the Sisters District of the Deschutes National Forest, Jefferson County, Oregon. It is separated from the Mt. Jefferson Wilderness by the Confederated Tribes of the Warm Springs Indian Reservation and the Metolius River.

The RA is reached by traveling northwest from Bend, Oregon, on U.S. Highway 20 for 32 miles, then north on County Road 14 for 12 miles, then north for 3 miles on Forest Road 1499.

No developed trails exist within the RA.

### Geography and Topography

The RA is on the breaks of Green Ridge. It is mainly composed of steep and unstable granular slopes. The principle feature in the area is Castle Rocks, an unusual group of rock pinnacles.

Elevation ranges from 4800 feet on Green Ridge to 2200 feet near Spring Creek.

Precipitation ranges from 20 to 45 inches per year and falls primarily in the form of snow. The area is drained by tributaries of the Metolius River.

### Soil Types

The soil types are based on the Deschutes National Forest Soil Resource Inventory.[1]

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[1] Daniel H. Larsen, Soil Resource Inventory, Deschutes National Forest, Pacific Northwest Region, 1976.

Soils are low to mid elevation types which vary by position on the landscape. The toeslope and alluvial fans at the west and north base of Green Ridge are gravelly to very stony, light brown and excessively drained sandy loams. Escarpment and steep canyon wall soils are shallow, stony sandy loams with rock outcrops. The flatter areas to the east are either shallow or moderately deep loamy soils formed over lava flows or weathered ash flow tuffs overlying a sandy loam surface with loam or clay loam subsoils.

| Land Type | Landform | Percent Slope | Elevation |
|---|---|---|---|
| 26 | Toeslopes and Alluvial Fans | 10-30 | 3000-4000 |
| 50 | South Slopes of Canyon Walls | 30-70 | 2300-4500 |
| 51 | South Slopes of Canyon Walls | 30-60 | 2400-3800 |
| 52 | North Slopes of Canyon Walls | 30-60 | 2400-3800 |
| 60 | Lava Plains | 0-30 | 3200-3600 |
| 89 | Escarpments of Green Ridge | 30-80+ | 3300-4700 |
| 90 | Toeslopes of Green Ridge | 0-30 | 3200-3600 |

## Vegetation

Plant communities present are: mixed conifer/snowberry/pinegrass and mixed conifer/snowbrush-chinkapin plant communities dominate the west and north facing slopes of the area. Ponderosa pine/bitterbrush/bunchgrass communities dominate the dry east facing slopes. Mixed conifer/snowbrush-chinkapin/brackenfern and mixed conifer/snowberry/pinegrass communities are common on northerly aspects on the east side of the area. The juniper/bitterbrush/bunchgrass community occurs on dry sites throughout the area.

## Ecosystem Type

The western half of the RA is primarily mixed conifer forest with small inclusions of ponderosa pine forest. The east half of the RA has approximately equal proportions of mixed conifer forest, ponderosa pine forest, and grass shrublands with big sagebrush and scattered ponderosa pine and western juniper.

The majority of the forested land is in either mature or old growth successional stages. Clusters of young, pole, or seedling/sapling forest are scattered throughout the RA. This mixture creates a relatively good diversity of plant communities and successional stages which support a variety of wildlife species.

Riparian ecosystems occur along Spring Creek and Street Creek. These ecosystems are relatively narrow, averaging from 5 to 20 feet on Spring Creek, and 15 to 20 feet on Street Creek. The forest along Spring Creek is predominantly coniferous with red fir, mountain hemlock, and little or no shrubbery. Street Creek has a wide variety of shrubs, with alder dominating over Douglas maple, dogwood, and big leaf maple.

Unique wildlife species found include the Merriams turkey, pileated woodpecker, and western rattlesnake. Black bear and cougar have also been reported in the area.

Turkeys were introduced onto Green Ridge and along the Metolius River more than 30 years ago. Meriams turkeys were restocked in 1984 and 1985.

Pileated woodpeckers are found in mixed conifer old growth forests of this RA.

Western rattlesnakes are found in the drier forested and nonforested sites, especially eastward near the boundary of the forest. This is the only occurrence of rattlesnakes on the Forest.

Mule deer belonging to the Metolius Herd Management Unit use the area as summer range. Winter and transition range is found in the east end, especially in the shrub-grasslands.

Roosevelt elk occasionally move through the area in small family units. Though unverified, biologists suspect that these elk move back and forth across the Metolius River between the Warm Springs Indian Reservation and Green Ridge. They apparently winter either on the Reservation's side of the River, or, during milder years, on the Deschutes side.

A bald eagle nesting site is located one mile southest of Monty Campground. The bald eagle is listed by the Fish and Wildlife Service as a threatened species. One nest site, active since at least 1981, contains three nests. This pair of birds apparently feeds on fish or waterfowl from the Metolius River to Lake Billy Chinook.

It is possible, although not verified, that an occasional peregrine falcon may use the Metolius River canyon to hunt for waterfowl, shorebirds, or smaller passerines. However, there are no known cliffs of suitable character for nesting in the RA.

Bean Creek and Spring Creek have no fisheries potential because of ephemeral flows. Street Creek is a very small stream with a modest population of small (sub-legal size) rainbow trout. It has little potential for a recreational fishery.

## Current Uses

The Recreation Opportunity Spectrum (ROS) inventory category is "Primitive". Primary recreation uses are hiking, hunting, and dispersed camping. No recreation use statistics have been developed for the area, but it is assumed that the most common use is big game hunting.

The Monty Helicopter Timber Sale is proposed for FY 1987 within the RA, but no layout activities have occurred. Castle Rocks Timber Sale has been sold but road building has been done. Other proposed sales include Little Z and Ridgetop.

The area borders the Warm Springs Indian Reservation.

## Appearance

The RA gives a steep, rugged, and virgin appearance. The steep slopes and heavy fuels have resulted in many fires. Plant communities vary considerably, depending upon slope, aspect, and elevation. Spring Creek is the only year-round water source.

## Surroundings

The RA is roughly horseshoe shaped and averages about 1.5 miles in width. The lands within the "U" shape are heavily roaded and logging activities are prevalent. The outside periphery is bounded by County Road 64, Forest Road 1499, and the Metolius River. A few private land parcels occur along the river and adjacent to the RA and have a few cabins on them.

Monty and Perry South Campgrounds lie adjacent to the northeast portion. These two developed areas received 8,600 Recreation Visitor Days (RVD's) in 1983.

Forest Road 1499 and County Road 64 (from Monty Campground north) are low standard primitive roads. Vehicular use is minimal.

## Attractions

The major attractions within the RA include the scenery, geological formations, virgin forests, and wildlife. Big game hunting is the primary attraction at this time. There are several ridgetop vistas within the area; however, access is not easily gained by vehicle or foot.

## CAPABILITY

## Manageability and Boundaries

The ability to manage an area as roadless must be considered before a recommendation can be made. Factors such as size, shape, and location are important.

The shape of the RA presents the greatest management problem. The narrow width (1.5 miles) precludes a quality environment where solitude and primitive recreation are key ingredients. External influences such as logging, vehicular use, and private lands exist on all sides of the area. Outside noises could distract from the experience.

The RA is accessible by road on all sides. This allows for adequate transportation access and trailheads.

The irregular shape would require extensive posting in order to be easily recognized.

The steep slopes and high fuel loads increase the potential for a catastrophic fire.

## Natural Integrity

The vast majority of the RA is in a natural state and unaffected by human influences.

Slash and field burning around the RA produce air pollution for short periods of time, but they have not affected natural processes within the RA.

The natural process has been most heavily affected by the rapid suppression of wildfire in half the area.

## Apparent Naturalness

Smoke from slash and field burning will have the greatest influence on the apparent naturalness as perceived by the user. The long term influence is negligible.

## Opportunities for Solitude

The opportunity for solitude is based on the following factors: size of area, topographic screening, vegetative screening, distance from perimeter to core, and human intrusions. The opportunity in this RA is low because of the short distance from perimeter to core.

## Primitive Recreation Opportunities

Solitude and the following additional factors are used for rating primitive recreation: diversity of opportunities, challenge, and absence of facilities. Overall, the opportunity for a primitive recreation experience is low for this area.

The opportunities that do exist include hiking, backpacking, camping, hunting, photography, nature study, viewing outstanding scenery, and acquiring general knowledge and appreciation of nature and the environment.

## Challenging Experiences

This attribute considers the RA's ability to offer opportunities for unusual adventure, excitement, challenge, self-reliance, initiative, and judgment. Challenging features include dangerous animals, climatic disturbance, avalanche potential, terrain features (i.e., cliffs, quicksand, sink holes), fast-moving water, glaciers, and a lack of dominant visual features on which to orient oneself. The area is steep and the lower elevations are inhabited by rattlesnakes, but, overall, challeging features are rare.

## Special Features

One threatened species (plant, animal, or insect) is known to exist in the RA. The bald eagle (Federally listed as threatened) nesting site is located one mile southeast of Monty Campground.

## Historic and Scientific Study

This RA receives a "significant" rating because of its geological features infrequently found in the High Cascade Physiographic Province, particularly Castle Rocks. These formations provide a special opportunity for outdoor education and scientific study.

## Availability and Resource Potentials

Refer to Table C-1.

### Management Considerations

Smith Cabin, a cultural resource, is located in the RA.

Dispersed camping along the Metolius River adjacent to the north and west of the RA is heavy. The incidence of man-caused fire is high, which could provide a high risk for escaped fire into the RA. Fuels are heavy and slopes are steep in the RA, both creating high potential conditions for catastrophic wildfires.

New management direction is being developed and should be coordinated with the Confederated Tribes of the Warm Springs Indian Reservation.

## NEED

### Nearby Wilderness and Its Use

The Mt. Jefferson Wilderness (32,734 acres on Deschutes National Forest) is the nearest Wilderness and is located about 6 miles east of the RA. It is currently being used at about 26 percent capacity.

Statistics for fiscal year 1983 indicate use on the Deschutes portion of the Mt. Jefferson Wilderness was 12,800 RVD's. About 30 percent of the use came from the local area, about 55 percent from other in-State locations, and about 15 percent from out of State.

Deschutes County, with a population of 63,300 in 1983, represents the majority of the Forest Influence Area.

### Distance From Population Centers

The Forest Influence Area includes the following towns: Sisters, Redmond, Tumalo, Bend, Sunriver, LaPine, Crescent, and Gilchrist. All of these are within 86 miles of the Wilderness. Bend, with the largest population (17,840), is 32 miles from the Wilderness by road. This distance is not excessive for people interested in a wilderness experience.

### Ecosystem Representation

No rare or unique ecosystems are known to exist within the RA.

### Congressional and Proponent Interest

There has been no congressional interest in the RA, and very little interest by proponents of wilderness in the private sector.

### Public Input

The RARE II evaluation process showed that 73 percent of the respondents wanted wilderness designation, while 27 percent wanted nonwilderness designation.

## Other Public Scoping Results

Two public workshops on Roadless Areas were conducted in 1984. Public comments were also requested through the "Forest Plan Report." The public expressed strong support for protecting the area and keeping it undeveloped. The Confederated Tribes of the Warm Springs Reservation expressed a concern that the area be managed in a manner compatible with their Plan. Their Land Use Plan states that adjacent lands will remain undeveloped.

# MT. JEFFERSON ROADLESS AREA
# (RARE NO. 06198)

## DESCRIPTION - THE EXISTING CONDITION

### History

The Mt. Jefferson Roadless Area (RA) was identified during the RARE II analysis process. Some boundaries have changed since 1979. The boundary in the vicinity of Jack Lake was adjusted to exclude the road, campground, and trailhead. Other boundaries were adjusted to exclude areas affected by logging activities. In section 21 of the most southern parcel the boundary was adjusted to exclude an existing road. These were excluded based on the premise that logging and other human developments are inconsistent with Roadless Area values.

### Location and Access

The Mt. Jefferson RA contains 2,608 acres and lies within portions of the following townships:

T. 11 S., R. 8 E., W.M.
T. 12 S., R. 8 E., W.M.
T. 13 S., R. 8 E., W.M.

This RA comprises seven different parcels that are contiguous with the east and south boundary of the Mt. Jefferson Wilderness. These parcels run from U.S. Highway 20 to the south to the vicinity of Cabot Creek in the north. The RA lies within the Sisters District of the Deschutes National Forest, Deschutes County, Oregon.

The area is reached by traveling northwest from Bend, Oregon, on U.S. Highway 20 for 34 miles, then right on Forest Road 12. With the exception of the parcel near Highway 20, access to the various parcels can be gained by following Forest Road No. 1234, No. 1235, or No. 1230.

About 2 miles of Trail Number 65 pass through the southernmost parcel.

### Geography and Topography

The topography of the RA ranges from steep to gentle mountain slope. It is located on the eastern slope of the Cascades and is drained by tributaries of the Metolius River. Interesting or unusual features are lacking.

Elevation ranges from 3900 feet in the northern most parcel to 5300 feet in the south.

Precipitation ranges from 60 to 65 inches per year and falls primarily in the form of snow. The porous volcanic soil causes most moisture to soak directly into the ground.

## Soil Types

The soil types described here are based on the Deschutes National Forest Soil Resource Inventory.[1]

Soils are mid-elevation types consisting of moderately deep soils with a surface of Mazama ash or a cindery ash from Belknap Crater. These surface soils are fine brown and well drained sands. A bleached gray layer occurs within the surface horizon under mountain hemlock stands. Subsoils are either formed from stony glacial till or bedrock talus slopes. Bare talus and bedrock exposures are common on steeper slopes.

| Land Type | Landform | Percent Slope | Elevation |
|---|---|---|---|
| 12 | Talus Slopes | 20-70 | 4300-6500 |
| 16 | Sloping Uneven Glaciated Uplands | 15-40 | 4200-6500 |
| 17 | Gentle Uneven Glaciated Uplands | 0-30 | 3000-4700 |
| 21 | South Slopes of Glaciated Moraines | 25-60 | 3300-5700 |
| 22 | Glaciated Moraines & Valley Walls | 25-60 | 3300-5700 |
| 24 | Glaciated Moraines & Sideslopes | 20-60 | 3600-4300 |
| 94 | Uneven Glaciated Uplands | 10-20 | 4400-4900 |
| 95 | Uneven Glaciated Uplands | 0-30 | 3700-4400 |

## Vegetation

Plant communities present are: mixed conifer/snowbrush, chinkapin/pine grass, mixed conifer/snowbrush/sedge/brakenfern, mixed conifer/snowberry/forb, and mountain hemlock-lodgepole pine-true fir/beargrass.

## Ecosystem Type

All of the parcels comprising the EA, with the exception of one parcel on the north side of Bear Valley, are classified as mixed conifer forest. Bear Valley is composed of mixed conifer forest with pockets of lodgepole and ponderosa pine.

The Cabot Creek, Brush Creek, and Canyon Creek parcels are mostly in the "old growth" successional stage. The Bear Valley parcel was burned by wildfire in 1945 and is a mosaic of "seedling/sapling", "mature", and "old growth" forest. The "seedling/sapling" stage is dominated by snowbrush ceanothus and greenleaf manzanita.

Riparian ecosystems are present along Brush Creek and Canyon Creek. The Brush Creek riparian zone is a narrow band (5-10 feet wide) of spruce forest with grass/forb ground cover. Alder, vine maple, serviceberry, snowberry, and thimbleberry are also common. Canyon Creek and a tributary of Cabot Creek are of similar character.

The area is summer range for mule deer of the Metolius Herd Management Unit. The riparian plant communities, and the early seral stages of the Bear Valley segment, are important deer range.

[1] Daniel H. Larsen, Soil Resource Inventory, Deschutes National Forest, Pacific Northwest Region, 1976.

Roosevelt elk are occasionally found during summer as family units comprised of only a few animals.

No Federally listed Endangered or Threatened species of animals or plants are known in the RA. The spotted owl is the only Regional Forester-designated Sensitive species known or suspected in this RA. No special surveys for the presence of sensitive plant species have been undertaken.

No lakes are present in this RA. Brush Creek has little or no fisheries potential, possibly due to low flows during a part of the year or serious scouring by winter anchor ice.

### Current Uses

The Recreation Opportunity Spectrum (ROS) inventory category is "Semiprimitive Motorized". Primary recreation uses are hiking, horseback riding, hunting, and dispersed camping. No recreation use statistics have been developed for these small areas.

As of March 1985, the RA contains parts of the following proposed timber sales: Long Lake, Upper Jack, and Abbot Springs. No sale layout has taken place at this time.

One geothermal lease occurs in the RA.

### Appearance

The RA is contiguous with the Mt. Jefferson Wilderness Area and shares the same general appearance, though interesting landforms are not present in the RA. About 70 percent of the area is in the mixed conifer plant communities. All seven parcels are densely forested and scenic views are not an important factor. Small streams are found in five of the parcels.

### Surroundings

The RA is bounded on the west by the Mt. Jefferson Wilderness which is protected under the Wilderness Act of 1964. The use of this area is further discussed in the "Need" section.

One parcel is in the vicinity of Jack Creek Campground and Jack Lake, which is a popular camping and swimming area. Recreation use totalled 5,500 Recreation Visitor Days (RVD's) in 1983.

The most southern parcel lies adjacent to the Santiam Highway (U.S. Highway 20).

Logging and road building are occurring adjacent to all parcels.

### Attractions

The major attractions within the RA include small streams, virgin forest, and wildlife.

Easy access and good snow depth make the southern parcel attractive for cross-county skiing.

## CAPABILITY

### Manageability and Boundaries

The ability to manage an area as unroaded must be considered in the context of its size, shape, and location.

The recreational development in the vicinity of Jack Lake will affect the manageability of the adjacent parcel. The noise and high level of activity would detract from the undeveloped recreation experience.

The heavy traffic and noise on the Santiam detract from the experience in the southern parcel.

The various existing roads provide adequate opportunity for transportation access and trailheads. It seems unlikely that new trails would be needed.

### Natural Integrity

The vast majority of the RA is in a natural state and unaffected by human influences.

The trail system is not extensive and its effect upon the immediate area is low.

Slash burning around the RA produces air pollution for short periods of time, but it has not affected natural processes within the RA.

The natural processes have been most heavily affected by the suppression of wildfire in the area.

### Apparent Naturalness

Of the human-caused effects discussed in the previous section, the small size of the areas and the development and activity that occurs next to them alters the apparent naturalness.

### Opportunities for Solitude

The opportunity for solitude considers the following factors: size of area, topographic screening, vegetative screening, distance from perimeter to core, and human intrusions. Due to the small size of the areas and the activity next to them, there is little opportunity for solitude.

### Primitive Recreation Opportunities

Solitude and the following additional factors are used for rating primitive recreation: diversity of opportunities, challenge and absence of facilities. Overall, limited opportunity exists for primitive recreation.

Existing opportunities include hiking, hunting, backpacking, camping, ski touring, horseback riding, photography, nature study, and acquiring general knowledge and appreciation of nature and the environment.

## Challenging Experiences

This attribute considers the area's ability to offer opportunities for unusual adventure, excitement, challenge, self-reliance, iniative, and judgment. Challenging features include dangerous animals, climatic disturbance, avalanche potential, terrain features (i.e., cliffs, quicksand, sink holes), fast-moving water, glaciers, and a lack of dominant visual features on which to orient oneself. This area has few hazardous features.

## Special Features

Northern Spotted Owl habitat is identified within the RA, a "sensitive" species designated by the Regional Forester.

## Historic and Scientific Study

This RA receives an "infrequent" rating for its geological, ecological, and cultural features. This rating is given to features often found in the High Cascade Physiographic Province.

## Availability and Resource Potentials

Refer to Table C-1.

## Management Considerations

Mountain pine beetles are infesting lodgepole pine stands to near epidemic levels on the Forest. Entomologists predict that this epidemic will continue for another 10 to 15 years until the beetle's major food supply of lodgepole pine is either consumed or destroyed. In Roadless Areas, this activity may be setting the stage for a catastrophic fire.

NEED

## Nearby Wilderness and Its Use

The Mt. Jefferson Wilderness (32,734 acres on the Deschutes National Forest) is the nearest Wilderness and is located adjacent to the western boundary. It is currently being used at about 26 percent capacity.

Statistics for fiscal year 1983 indicate use for the Deschutes portion of the Mt. Jefferson Wilderness was 12,800 RVD's.[2] About 30 percent of the use came from the local area, about 55 percent from other in-State locations, and about 15 percent from out of State.[3]

In considering local use, travelers from the Willamette Valley were the most frequent visitors.

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[2] 1983 RIM Data.

[3] This data based on analysis of 1981 Wilderness permits for the Three Sisters Wilderness.

## Distance From Population Centers

Most of the visitors came from the Willamette Valley which is located 100 miles west of the RA. Other population centers are: Sisters, Redmond, Tumalo, Bend, Sunriver, LaPine, Crescent, and Gilchrist. All are within 90 miles of the Wilderness. Bend, with the largest population (17,840), is 40 miles from the Wilderness by road. These distances are not excessive for people inerested in a wilderness experience.

## Ecosystem Representation

No rare or unique ecosystems are known to exist within the RA.

## Congressional and Proponent Interest

No congressional interest and very little interest by wilderness proponents has been expressed for this RA.

## Public Input

The RARE II evaluation process showed that 73 percent of the respondents wanted wilderness designation, while 27 percent wanted nonwilderness designation.

Additional public input will be sought before the final determination is made.

## Other Public Scoping Results

Two public workshops on Roadless Areas were conducted during early 1984. Public comments were also requested through the "Forest Plan Report." Most comments favored increasing the size of the Mt. Jefferson Wilderness which lies adjacent to these areas. No specific comments on the individual small areas were received.

# NORTH PAULINA ROADLESS AREA
## (RARE NO. 06196)

## DESCRIPTION - THE EXISTING CONDITION

### History

The North Paulina Roadless Area was included in both the RARE I and RARE II analysis processes. A change occurred in 1983 when Forest Road 9735 was built across the lava near Kwinnum Butte. This road separated Lava Cast Forest from the North Paulina Roadless Area, and it no longer met the 5,000 acre minimum Roadless Area requirement. The pumice claim between East and Paulina Lakes and a small tract near Cinder Hill Campground were also excluded due to human activities inconsistent with Roadless Area values.

### Location and Access

The North Paulina Roadless Area contains 21,622 acres and lies within portions of the following townships:

T. 21 S., R. 12 E., W.M.
T. 21 S., R. 13 E., W.M.
T. 22 S., R. 13 E., W.M.

The Roadless Area includes the northern half of Newberry Crater in the Fort Rock District of the Deschutes National Forest, Deschutes County, Oregon.

Access is best gained by traveling 24 miles south from Bend, Oregon on U.S. Highway 97, then 13 miles east on County Road 21.

There are approximately 15 miles of trail within the Roadless Area. Trail No. 57, the Newberry Crater Rim Loop; Trail No. 61, the Swamp Wells trail; and Trail No. 58, the Newberry Crater trail, all cross through the area.

### Geography and Topography

Newberry Crater is an ancient shield-shaped volcano which rises above the encircling plateau. The Crater is a caldera that resulted from a collapse of the summit. The summit depression contains two popular recreation lakes, East and Paulina.

The Roadless Area lies atop the northern rim and flank of Newberry Crater. This area is characterized by numerous cinder cones, buttes, and lava flows. The terrain varies from rolling topography to steep cinder slopes.

The elevation ranges from 5700 feet near Paulina Creek to 7686 feet on top of North Paulina Peak.

The precipitation ranges from 20 to 30 inches per year and falls primarily in the form of snow. The porous volcanic soils causes the moisture to soak directly into the ground. Very little runoff occurs. There is no surface water within the Roadless Area itself.

## Soil Types

The soil types decribed here are taken from the Deschutes National Forest Soil Resource Inventory.[1]

Soils are the high to mid elevation types composed of either sandy brown Mazama ash overlying a buried bedrock lava with many exposed basalt outcrops, or a deep deposit of pumice from the more recent Newberry eruptions. A bleached grey soil occurs in the surface horizon under mountain hemlock stands. On steep slopes within and on the flanks of the crater, exposed rock is common, and slopes are stable.

| Land Type | Landform | Percent Slope | Elevation |
|---|---|---|---|
| 84 | Dissected Sideslopes | 30-80 | 6000-7000 |
| 85 | Ridge Tops and Flats | 0-30 | 6000-6800 |
| 7A | Rough Uneven Lava Flows | 5-15 | 5800-7000 |
| 9K | Smooth to Gentle Sloping Lands | 0-30 | 5800-7000 |

## Vegetation

Plant communities present are: mountain hemlock/grouse huckleberry, lodgepole pine/grouse huckleberry, mixed conifer/manzanita, lodgepole pine/manzanita, lodgepole pine/needlegrass basins, lodgepole pine/lupine-needlegrass, mixed conifer/snowbrush-manzanita, ponderosa pine/bitterbrush-manzanita/needlegrass, lodgepole pine/bitterbrush/needlegrass, and lodgepole pine/bitterbrush. The lodgepole pine communities occupy 85 percent of the area, mountain hemlock 14 percent, and ponderosa pine 1 percent.

Lodgepole pine communities are partly infested by the mountain pine beetle from epidemic to catastrophic proportions. Many of the trees are now turning red, and it seems likely that the condition will worsen.

## Ecosystem Type

The majority of the area is overmature (old growth) lodgepole pine forest, with scattered islands of old growth mountain hemlock. Stands of mixed conifer (ponderosa pine, lodgepole pine, and white fir) and ponderosa pine forest, both predominantly in mature or old growth successional stages, are found at the north end of the Roadless Area. Early forest successional stages are scarce, indicating very little wildlife history during the last 40 to 60 years.

Wildlife species are typical of the various plant associations and successional stages present. Species favoring early successional stages are relatively rare (i.e., rufous-sided towhee, green-tailed towhee, and mountain bluebird).

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[1] Daniel H. Larsen, Soil Resource Inventory, Deschutes National Forest, Pacific Northwest Region, 1976.

The Roadless Area is part of the summer range for mule deer of the Paulina Game Management Unit. These animals winter on the east fringe of the District south of Pine Mountain. The area is also summer range for a few elk.

The cover to forage ratios and arrangements for big game indicate an over-abundance of cover, with less than optimum forage quality due to canopy closure and forage species composition. As mountain pine beetle damage increases, some loss of cover will occur.

A bald eagle nesting site is located on the north shore of East Lake. The bald eagle is listed by the Fish and Wildlife Service as a threatened species.

The Roadless Area borders Paulina Creek. Water quality is excellent for supporting a fishery but habitat is less than optimum due to an absence of pools.

Current Uses

At the present time about 30 percent of the Roadless Area is allocated to the Special Management Option and about 70 percent is allocated to the Wood/Forage Management Option. The Special Management area is located on the rim and in the crater adjacent to the lakes.

The Recreation Opportunity Spectrum (ROS) inventory category is "Semiprimitive Motorized". Primary recreation uses are snowmobiling, horseback riding, and hiking. Use statistics for fiscal year 1983 indicate approximately 1,500 recreation visitor days (RVD's) for snowmobiling, 150 RVD's for horseback riding, and 100 RVD's for hiking. There is also some mountain biking and all terrain vehicle (ATV) use of the area. The pumice flats and bowls on the rim and in the vicinity of North Paulina Peak are popular play areas for snowmobiling. These areas and the trails receive the bulk of the use. The rest of the Roadless Area receives very little human activity.

As of March 1985, there were two geothermal test holes in the RA. They have been capped and the area impacted is negligible.

Appearance

The Roadless Area lies atop the northern rim and extends down the flank of Newberry Crater. The east rim is fairly high and open, and offers views of the Crater and East and Paulina Lakes. North Paulina Peak offers panoramic views of the Cascades and the encircling plateau. Vegetation on much of the rim is dense, dwarfed, and stunted by the harsh growing conditions. Several barren pumice flats dot the landscape. The portion of the Roadless Area on the northern flank is rolling country with many timbered cinder cones and barren lava flows.

The lodgepole pine forest throughout the area is heavily infected by the mountain pine beetle and is gradually turning a rust color. This condition will worsen, and it will be years before the green color again dominates. The islands of fir and hemlock add diversity to the area and will be unaffected by the mountain pine beetle.

## Surroundings

The Roadless Area is bounded on the east and west by lands allocated to the Wood/Forage Management Option. The management goal in these areas is for optimum and sustainable levels of timber production while providing wildlife forage and opportunities for public recreation.

A small portion is bounded on the north by the Lava Cast Forest Geological Area, a special interest area whose management goal is preservation and interpretation of this unique geological feature. In 1983, recreation use in this area was about 1,200 RVD´s.

Newberry Crater to the south has the greatest influence upon the Roadless Area. This is a developed recreation area receiving intensive recreation use. Recreation use for this area totaled 208,950 RVD´s in developed use and 1,750 RVD´s in dispersed use in fiscal year 1983. The summer season is short at this elevation, but the lakes are an excellent and popular fishing area. There are eight campgrounds, five picnic sites, six summer homes, one private R.V. park, one defunct organizational site, and two resorts in the occupancy zone adjacent to the lakes. The resort at Paulina Lake now remains open through the winter to serve winter recreationists. Snowmobiling has become especially popular in the Crater.

## Attractions

The major attractions within the Roadless Area are wildlife, geology, and scenery.

A portion of the Roadless Area falls within the Newberry Crater Wildlife Reserve. Consequently, visitors to the area have an opportunity to observe wildlife in a pristine and protected setting.

The Roadless Area contains of a multitude of unique volcanic features.

The opportunity for viewing outstanding scenery exists at a few points around the rim and on North Paulina Peak. The dense lodgepole pine forest inhibits viewing scenery from most of the existing trails.

## CAPABILITY

## Manageability and Boundaries

The ability to manage an area as unroaded must be considered before a recommendation can be made. Factors such as size, shape, and location are important.

Intensive recreation development adjacent to the RA would most heavily affect the manageability of the North Paulina RA. Noise and a high level of activity would detract from the undeveloped recreation experience--especially along the rim area. This RA is not large enough to sufficiently buffer these external influences.

The fact that the RA is within a high potential geothermal area could present some management problems if that potential is developed. Geothermal power plants adjacent to the area add an element of industrialization that may detract from an undeveloped recreation experience. One could expect impacts such as construction noises, winter steam plumes and power lines.

The RA boundaries do provide adequate opportunity for transportation access and traveler transfer facilities such as trailheads.

The mountain pine beetle infestation presents a situation which could lead to a catastrophic fire.

## Natural Integrity

The vast majority of the RA is in a natural state and unaffected by human influences.

Forest roads run adjacent to the RA on the east and north boundaries. Along these roads, firewood gathering has impacted a strip approximately one-half mile wide. A few hunting camps have been established along Forest Service Road 9710.

The trail system is not extensive and its impact is very slight.

Slash burning around the RA produces some air pollution for short periods of time, but it has not affected natural processes within the RA.

One bird guzzler is located near Red Hill. This improvement affects about one-quarter mile of the RA.

Roads have been cleared on a proposed road extending off Forest Service Road 9735-600 for the North Peak Timber Sale. About one mile of clearing is completed, but no construction has begun on the roadbed itself.

The ecology and natural succession has been altered by the control of wildfire in the RA.

## Apparent Naturalness

Most of the human-caused effected discussed in the previous section are located near the boundary. Of these, the road clearing in the western portion will have the greatest influence on the apparent naturalness as perceived by the user. The rest of the area away from the boundaries are free of disturbance.

## Opportunities for Solitude

The opportunity for solitude is rated according to the following factors: size of area, topographic screening, vegetative screening, distance from perimeter to core, and human intrusions. Overall, there is a moderate opportunity for solitude.

This RA is not large enough to adequately buffer outside influences, especially noise. The spirit of adventure, serenity, and self-reliance is diminished when the sounds of civilization can be heard just a few miles away.

### Primitive Recreation Opportunities

Solitude and these additional factors are used for rating primitive recreation experience: diversity of opportunities, challenge and absence of facilities. Overall, opportunity for primitive recreation is low.

Existing opportunities include hiking, backpacking, camping, hunting (outside the wildlife reserve), ski touring, horseback riding, mountain biking, photography, nature study, and acquiring a general knowledge and appreciation of the outdoors and environment.

### Challenging Experiences

The RA is rated as to its ability to offer opportunities for unusual adventure, excitement, challenge, self-reliance, initiative, and judgment. The RA receives a "Rare" rating because of its size and the lack of surface water are important reasons for this rating. Hazardous features are seldom encountered.

### Special Features

One threatened species (plant, animal, or insect) is known to inhabit the RA. A bald eagle (Federally listed as threatened) nesting site is located on the north shore of East Lake; the RA is part of its range.

### Historic and Scientific Study

The Newberry Volcano gives this RA a "unique" quality, a rating given to rare, natural, or cultural features. The area is geologically young (1300 years) and provides opportunities for outdoor education and scientific study. As part of this large formation, the RA contains significant features including the northwest rift zone extending toward Lava Butte, ring fractures, numerous cinder cones, lava flows, and tree casts.

Archaeological sites are identified along the southern boundary of the RA near the lakes. Prehistoric people used the obsidian flow as a quarry site. These people undoubtedly entered the Crater by many routes, and it is likely that many more sites will be found as cultural resource surveys are completed. The opportunities for scientific and archeological study are also "unique".

### Availability and Resource Potentials

Refer to Table C-1.

### Management Considerations

The mountain pine beetle infestation has been at, or near, epidemic proportions in lodgepole pine communities on the Forest for several decades. Entomologists predict that this epidemic will continue for another 10 to 15 years until the beetle´s main food supply of lodgepole pine is either consumed or destroyed. In Roadless Areas, the mountain pine beetle epidemic may set the stage for a catastrophic fire.

## NEED

### Nearby Wilderness and Its Use

The Three Sisters Wilderness (94,247 acres on Deschutes National Forest) is the nearest Wilderness and is located about 27 air miles to the west. It is currently being used at about 35 percent capacity.

Statistics for fiscal year 1983 indicate use for the Deschutes Portion of the Three Sisters Wilderness was 48,900 RVD's.[2] About 30 percent was local use, about 55 percent from other in-State locations, and about 15 percent from out of State.

Deschutes County, which had a population of 63,300 in 1983, represents the majority of the Forest Influence Area.

### Distance from Population Centers

The Forest Influence Area includes the following towns: Sisters, Redmond, Tumalo, Bend, Sunriver, LaPine, Crescent, and Gilchrist. All of these are within 60 miles of the Wilderness. Bend, with the largest population (17,840), is 37 miles from the Wilderness which is not excessive for people interested in a wilderness experience.

### Ecosystem Representation

No rare or unique ecosystems are known to exist within the RA.

### Congressional and Proponent Interest

There has been no congressional interest in the RA.

### Public Input

The results of the RARE II evaluation process show that 3 percent of the respondents want a wilderness designation and 27 percent wanted nonwilderness designation. The remaining 70 percent requested evaluation before making the final determination.

### Other Public Stoping Results

Two public workshops regarding Roadless Areas were held in 1984. Public comments were also requested through the "Forest Plan Report." Considerable interest was expressed regarding the Roadless Area compared to the interest expressed during the RARE II process. This largely stems from the potential for geothermal development. Comments were split between development and nondevelopment of the area.

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[2] 1983 RIM Data.

[3] This data based on analysis of 1981 wilderness permits for the Three Sisters Wilderness Area.

# SOUTH PAULINA ROADLESS AREA
## (RARE NO. 06197)

## DESCRIPTION - THE EXISTING CONDITION

### History

The South Paulina Roadless Area (RA) was included in both the RARE I and RARE II analysis processes. Some boundaries have changed since 1979. Minor boundary adjustments were made to exclude roaded areas that were inadvertently included in the initial inventory. In addition, the boundary was adjusted to exclude the powerline into East Lake Resort. The reason for excluding these portions was based on the premise that human developments are inconsistent with Roadless Area values.

### Location and Access

The South Paulina RA contains 9,915 acres and lies within portions of the following townships:

T. 21 S., R. 12 E., W.M.
T. 22 S., R. 12 E., W.M.
T. 21 S., R. 13 E., W.M.
T. 22 S., R. 13 E., W.M.

The RA includes the southern half of Newberry Crater in the Fort Rock Ranger District of the Deschutes National Forest, Deschutes County, Oregon.

Access is best gained by traveling 24 miles south from Bend, Oregon, on U.S. Highway 97, then 13 miles east on County Road 21.

There are approximately 17 miles of trail within the RA. The following trails are included: No. 57, No. 57A, No. 58, No. 58A, No. 58B, and No. 58C.

### Geography and Topography

Newberry Crater is an ancient shield volcano which rises above the encircling plateau. The crater is a caldera that resulted from a collapse of the summit. The summit depression contains two popular recreation lakes--East and Paulina.

The RA lies atop the southern rim and flank of Newberry Crater. The area is characterized by lava flows, pumice flats, and numerous cinder cones. The topography ranges from steep to gentle.

The elevation ranges from 5800 feet along the eastern boundary to 7984 feet on Paulina Peak.

The precipitation ranges from 20 to 30 inches per year and falls primarily in the form of snow. The porous volcanic soil cause the moisture to soak directly into the ground. Very little runoff occurs. The only surface water within the RA is Lost Lake.

## Soil Types

The soil types described here are taken from the Deschutes National Forest Soil Resource Inventory.[1]

Soils are the high to mid-elevation types, composed of either sandy brown Mazama ash overlying a bedrock lava with many exposed basalt outcrops, or a deep deposit of pumice from the more recent Newberry eruptions. A bleached, gray soil occurs in the surface horizon under mountain hemlock stands. On steep slopes within and on the flanks of the crater, exposed rock is common, and slopes are stable.

| Land Type | Landform | Percent Slope | Elevation |
|---|---|---|---|
| 84 | Dissected Sideslopes | 30-80 | 6000-7000 |
| 85 | Ridge Tops and Flats | 0-30 | 6000-6800 |
| 7A | Rough Uneven Lava Flows | 5-15 | 5800-7000 |
| 9K | Smooth to Gentle Sloping Lands | 0-30 | 5800-7000 |

## Vegetation

Plant communities present are: mountain hemlock/grouse huckleberry, lodgepole pine/grouse huckleberry, mixed conifer/manzanita, lodgepole pine/manzanita, lodgepole/needlegrass basins, lodgepole pine/lupine-needlegrass, mixed conifer/snowbrush-manzanita, and ponderosa/bitterbrush-manzanita/needlegrass.

Lodgepole pine stands have for the most part been infested by the mountain pine beetle from epidemic to catastrophic proportions. Many of the trees are now turning red, and it is estimated by Forest Silviculturists that the condition will worsen.

## Ecosystem Type

Approximately 80 percent of this RA is forested. Half of the area is classified as lodgepole pine forest; the remaining forest is equally represented by mixed conifer and mountain hemlock classifications. These forest types are generally found on north facing aspects. Ponderosa pine forest accounts for less than 1 percent of the area.

The majority of this RA is classified as either "old growth" or "mature" forest. No "grass/forb" stage is present. The lodgepole pine forests show significant amounts of mountain pine beetle mortality.

One-fifth of the area consists of obsidian flows and cliffs, with associated talus. These are north or northeast facing, and have long-lasting snow cover.

The North Paulina, South Paulina, and Fort Rock deer herds summer here. Deer densities are not especially high in this summer range because of the absence of moist plant communities or dryland communities with extensive bitterbrush. A portion of the area is included in a wildlife reserve.

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[1] Daniel H. Larsen, Soil Resource Inventory, Deschutes National Forest, Pacific Northwest Region, 1976.

A few Roosevelt elk also summer here in small family units. The mixed conifer and mountain hemlock stands are probably used for cooling thermal cover on this predominantly south-facing side of Paulina Peak.

No fisheries exist within the RA.

## Current Uses

Most of the RA is currently allocated to the Special Management Option. The Special Management Area lies up on the rim and in the crater adjacent to the lakes.

The Recreation Opportunity Spectrum (ROS) inventory category is "Semiprimitive Motorized". Primary recreation uses are snowmobiling, horseback riding, and hiking. Use statistics for fiscal year 1983 indicate approximately 7,600 recreation visitor days (RVD's) for snowmobiling, 700 RVD's for horseback riding, and 500 RVD's for hiking. There is also some mountain biking and all terrrain vehicle (ATV) use. The pumice flats, Paulina Peak roads, and bowls on the rim are popular play areas for snowmobiling.

Newberry Crater and the lands surrounding it have become of interest as a possible source of geothermal steam energy. As of March 1985 there were 6 valid leases on 2,120 acres of land within the RA. There may be a developable geothermal energy resource of 20 to 70 kilowatts per acre. Other estimates run both higher and lower.

The Big Obsidian Flow is within the RA. This is a unique geological feature. An interpretive trail with signing runs along the eastern edge of the flow. Visitor use on this trail totaled 8,200 RVD's in 1983.

## Appearance

The Roadless Area lies atop the southern rim of Newberry Crater and extends down into the caldera. The high ground near Paulina Peak offers an outstanding view of Newberry Crater, the Big Obsidian Flow, and East and Paulina Lakes. To the south and west are panoramic views of the Cascades and the encircling plateau. Vegetation on much of the rim is dense, dwarfed, and stunted by the harsh growing conditions. Several barren pumice flats dot the landscape within the caldera.

The lodgepole pine forest throughout the RA is being heavily affected by the mountain pine beetle infestation and is gradually turning a rust color. This condition will worsen, and it will be years before the green color again dominates. Small islands of fir and hemlock add diversity to the area and will be unaffected by the beetle infestation.

## Surroundings

To the east, south, and west, the RA is bounded by lands allocated to the Wood/Forage Management Option. These areas have been affected by logging and woodcutting activities.

Geothermal leases have been applied for on lands to the east, south, and west. No development has begun, although four test holes have been drilled adjacent to the boundaries.

Newberry Crater to the north has the greatest influence upon the RA. This is a developed recreation area receiving intensive recreation use. Recreation use for this area totalled 208,950 RVD's in developed use, and 1,750 RVD's in dispersed use in FY 1983. The summer season is short at this elevation, but East and Paulina Lakes provide a good fishery and the area is popular. There are eight campgrounds, five picnic sites, six summer homes, one private recreation vehicle park, one defunct organizational site, and two resorts in the occupancy zone adjacent to the Lakes. The resort at Paulina Lake now remains open through the winter to serve winter recreationists. Snowmobiling is especially popular in the Crater.

The RA is bounded to the east and south by Forest Roads 21, 2127, and 2125. It is bounded to the west by Forest Road 2121. The Paulina Peak Road (FR 500) partially bisects the RA.

Paulina Peak is an important tourist viewpoint. The peak offers an outstanding panoramic view of the surrounding area. Mountain peaks in five States can be seen on a clear day. In 1983, 29,000 people visited Paulina Peak.

Attractions

The major attractions within the RA are wildlife, geology, and scenery.

Scenic views are accessible via the trail system along the Crater Rim Trail.

Easy access and excellent snow depth makes the area attractive to snowmobilers.

A portion of the RA falls within the Newberry Crater Wildlife Reserve. Consequently, visitors to the area have an opportunity to observe wildlife in a protected setting.

The RA contains a multitude of unique volcanic features.

## CAPABILITY

### Manageability and Boundaries

The ability to manage an area as unroaded must be considered before a recommendation can be made. Factors such as size, shape, and location are important.

Intensive recreation developments adjacent to the RA would most heavily affect the manageability of the South Paulina RA. Noise and high level of activity would detract from a primitive experience--especially along the Rim. This RA is not large enough to sufficiently buffer these external influences.

Because the RA is within a high potential geothermal area, management problems could arise if that potential is developed. Geothermal power plants adjacent to the area would add an element of industrialization, including construction noises, winter steam plumes, and powerlines, that is not compatible with Primitive or Semiprimitive recreation values.

The RA boundaries provide adequate opportunity for transportation access and trailheads.

The mountain pine beetle infestation could present another management problem. If the RA remains undeveloped, it would be an island where normal treatments could not be used. The fire hazard created by the dead and dying trees would also be a problem, increasing the potential for a catastrophic fire.

### Natural Integrity

The vast majority of the RA is in a natural state and unaffected by human influences. Forest roads run adjacent to the RA for several miles. Along these roads, firewood gathering has impacted a strip approximately one-half mile wide. A few undeveloped hunting camps have been established along Forest Service Road 9710. The trail systems are not extensive and their impact is very slight.

Slash burning around the RA produces air pollution for short periods of time, but it has not affected natural processes within the RA. The natural process has probably been most heavily affected by the control of wildfire in the area. The ecology and natural succession has been altered by the exclusion of fire.

The Yarder Timber Sale (sold in 1983) extends into the RA just east of 2121. When this sale is completed, that portion of the RA will no longer be roadless.

### Apparent Naturalness

Most of the human-caused effects discussed in the previous section are located near the boundary. Of these, the logging activities in the western portion will have the greatest influence on the naturalness of the area.

### Opportunities for Solitude

The opportunity for solitude is based on the following factors: size of area, topographic screening, vegetative screening, distance from perimeter to core, and human intrusions. Overall, there is a moderate opportunity for solitude.

This RA is not large enough to adequately buffer outside influences, especially noise. The spirit of adventure, serenity, and self-reliance is diminished when the sounds of civilization can be heard just a few miles away.

### Primitive Recreation Opportunities

Solitude and the following additional factors provide for primitive recreation: diversity of opportunities, challenge, and absence of faciliites. Overall, the opportunity for primitive recreation is low.

Existing opportunities include hiking, backpacking, camping, hunting (outside the wildife reserve), ski touring, horseback riding, photography, nature study, and acquiring general knowledge and appreciation of the outdoors and environment. The lack of diversity compared to other existing wilderness and undeveloped areas is the primary reason for the rating of Low.

## Challenging Experiences

A challenging experience is based on the area's ability to offer opportunities for unusual adventure, excitement, challenge, self-reliance, initiative, and judgment. Hazardous features are seldom encountered in the South Paulina RA.

## Special Features

No Endangered or Threatened species are known to exist in this RA. Although the cliffs of Paulina Peak are sufficiently vertical for potential use by peregrine falcons, and foraging sites are within 2 to 3 miles, no recent or historical peregrine nests are known.

Two Regional Forester-designated sensitive plant species -- pumice grape-fern (*Botrychium pumicola*) and little grape-fern (*Botrychium simplex*) -- are known to occur in the RA. Pumice grape-fern has also been found just outside the RA on the west slope of "The Dome."

## Historic and Scientific Study

This RA has a "unique" quality because it is part of the Newberry Volcano. The area is geologically young and offers opportunities for outdoor education and scientific study. The RA includes a part of the crater, and contains features such as the Big Obsidian Flow and fumaroles near Lost Lake.

Archaeological sites are identified within the RA. Prehistoric people heavily used the obsidian flow as a quarry site. They undoubtedly entered the Crater by many routes, and it is likely that many sites will be found as cultural resource surveys are completed. The opportunities for scientific and archaeological study are also "unique."

## Availability and Resource Opportunities

Refer to Table C-1.

## Management Considerations

The mountain pine beetle has infested lodgepole pine stands at, or near, epidemic levels on the Forest for several decades. Entomologists predict this epidemic will continue for another 10 to 15 years until the beetle's major food supply of lodgepole pine is either consumed or made unavailable. In Roadless Areas, the pine beetle epidemic may set the stage for a catastrophic fire.

NEED

## Nearby Wilderness and Its Use

The Three Sisters Wilderness (94,247 acres on Deschutes National Forest) is the nearest Wilderness and is located about 27 air miles to the west. It is currently being used at about 35 percent of capacity.

For fiscal year 1982, use of the Three Sisters Wilderness was 155,400 RVD's.[2] About 30 percent of the visitors came from local areas, about 55 percent from other in-State locations, and about 15 percent from out of State.[3]

Deschutes County which had a population of 63,300 in 1983, represents the majority of the Forest Influence Area.

## Distance from Population Centers

The Forest Influence Area includes the following towns: Sisters, Redmond, Tumalo, Bend, Sunriver, LaPine, Crescent, and Gilchrist. All of these are within 60 miles of the Wilderness. Bend, with the largest population (17,840), is 37 miles from the Wilderness, which is not excessive for people interested in an undeveloped recreation experience.

## Ecosystem Representation

No rare or unique ecosystems are known to exist within the RA.

## Congressional and Proponent Interest

The RA has received no congressional interest and little interest by wilderness proponents.

## Public Input

During the RARE II evaluation process, the Forest Service requested public comment. These comments were then analyzed to determine the preferred treatment of the RA's by people in the private sector. The results showed that 8 percent of the respondents wanted wilderness designation, while 91 percent wanted a nonwilderness designation. The remaining 1 percent requested that further planning be done before the final determination was made.

## Other Public Scoping Results

Two public workshops on Roadless Areas were conducted during early 1984. Public comments were also requested through the "Forest Plan Report." Public comment was split regarding keeping the area undeveloped or developing parts of it.

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[2] 1983 RIM Data.

[3] This data based on analysis of 12981 Wilderness permits for the Three Sisters Wilderness Area.

# THREE SISTERS ROADLESS AREA
## (RARE NO. 06192)

## DESCRIPTION - THE EXISTING CONDITION

### History

The Three Sisters Roadless Area (RA) was included in both the RARE I and RARE II analysis processes. From 1979 to 1983 some boundaries were adjusted. About 96 acres were altered by timber sales. Then the Oregon Wilderness Act of 1984 was passed and most of the RA was designated as Wilderness and added to the Three Sisters Wilderness Area.

Other human developments excluded between 1979 and 1983 included: (1) a road constructed in the Squaw Creek portion, and (2) water impoundments on Snow Creek and Little Three Creeks. The reason for excluding these portions was based on the premise that logging and other human developments are inconsistent 3ith Roadless Area values.

### Location and Access

The Three Sisters Roadless Area contains 8,315 acres and lies within township T. 15 - 19 S., R. 8 & 9 E., W.M.

What remains of this RA is a relatively narrow strip of land contiguous with the eastern side of the Three Sisters Wilderness. It is located north of Bench Mark Butte and south of Lucky Lake on the Bend District of the Deschutes National Forest, Deschutes County, Oregon and runs north onto the Sister Ranger District to a point near the McKinizie Highway.

The RA is very accessible via the Cascade Lakes Highway and Forest Roads 4228 and 4632.

There are two trails totaling approximately 4.5 miles within RA. Both trails provide access to the Three Sisters Wilderness area.

### Geography and Topography

The topography of the RA is hummocky and gently slopes to the east. There is one small stream within the RA.

The elevation ranges from 4500 feet to 5600 feet.

Precipitation ranges from 35 to 50 inches per year and falls primarily in the form of snow. It is usually late June or July before the snow melts. The porous nature of the soils causes most of the moisture to soak directly into the ground.

### Soil Types

The soil types described here are taken from the Deschutes National Forest Soil Resource Inventory.[1]

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[1] Daniel H. Larsen, Soils Resource Inventory, Deschutes National Forest,

Pacific Northwest Region, 1976.

Soils are the high elevation type consisting of a shallow layer of Mazama ash over stony glacial till or glacial scoured bedrock. In local areas a coarse pumice layer from Devils Hill or Rock Mesa occurs on the surface. In mountain hemlock stands a bleached grey horizon occurs in the surface soils. Otherwise soils are moderately deep, light brown, sandy, and excessively drained. Areas occupied by meadows, lakes, and bare rock are not good soil.

| Land Type | Landform | Percent Slope | Elevation |
|---|---|---|---|
| 12 | Talus Slopes | 20-70 | |
| 16 | Sloping Uneven Glaciated Uplands | 15-40 | 4300-6500 |
| 17 | Gentle Uneven Glaciated Uplands | 0-30 | 4200-6500 |
| 20 | Glaciated Uplands w/Many Lakes | 0-30 | 5300-6000 |

## Vegetation

Plant communities present are: hemlock/grouse huckleberry, lodgepole pine/grouse huckleberry, mixed conifer/snowbrush/sedge, mixed conifer/ snowbrush-manzanita/sedge-penstemon, lodgepole pine/sedge-lupine- penstemon, and lodgepole/sedge-lupine plant communities.

Where there is lodgepole pine it is currently infested by the mountain pine beetle to endemic proportions. It seems likely that this condition will worsen. However, the effect upon the visual quality should be minimal because there are few pure lodgepole pole stands.

## Ecosystem Type

Approximately 90 percent of the area is forested. Mountain hemlock forest prevails around McKenzie Pass. From near McKenzie Pass south to Squaw Creek, lodgepole pine predominates. Mixed conifer is found in the vicinity of Three Creeks Lake. A mosaic of mountain hemlock, mixed conifer, and lodgepole pine are found from Three Creeks Lake south to the southern tip of the area. These forested stands are mostly "old growth" and "mature" successional stages. Very few young or early successional stages are present. The 10 percent of the area that is not forested is primarly high elevation cinder or pumice covered flanks of Broken Top mountain or lava flows.

Riparian ecosystems are found as scattered moist meadows and along stream channels. Much of this is found in the Squaw Creek drainage.

Mule deer of the Upper Deschutes Herd Unit summer in the Area. Deer densities are probably highest in the segment of the area that flanks Broken Top mountain. Roosevelt elk are also concentrated near this area and near the riparian ecosystems in small family unit groups. An estimated 50 to 70 elk may spend their summer and fall season in this area.

The East Fork of Park Creek, Fall Creek, and Goose Creek all support brook trout. The streams have limited potential as fisheries because of very low water temperatures.

## Current Uses

About 50 percent of the RA is allocated to Protection Management. This management option provides custodial management and small-scale timber management experiments on sensitive sites until acceptable methods for managing the timber resource are determined. The other 50 percent is in the Visual Management Option. In this area the designated visual quality standards will be met.

The Recreation Opportunity Spectrum (ROS) designation is Semiprimitive, Motorized. Primary recreation uses have been hiking, cross-country skiing, horseback riding,and some snowmobiling. There are a few areas where the boundaries for motorized snowcraft use overlap the RA boundaries. No use statistics are available on this narrow strip but most of the use is primarly people passing through the area to points in the Three Sisters Wilderness.

## Appearance

The RA is contiguous with the Three Sisters Wilderness and has the same general appearance. It offers good variety in vegetation and landform. It is on the east slope of the Cascades and is drained by tributaries of the Deschutes River.

## Surroundings

The RA is bounded on the west by the Three Sisters Wilderness. Here, the goal is to protect and provide the benefits of Wilderness values for the public, in accordance with the Wilderness Act of 1964. The use of this area is further discussed in the "Need" section.

Most of the area to the east is allocated to Visual Management along the Cascade Lakes Highway and Wood Forage along much of the rest of the Boundary.

The nearness of the Cascade Lakes Highway and associated recreational development tends to have the greatest effect upon the RA. This highway receives heavy tourist traffic during the summer and fall and is an established snowmobile route during the winter.

Forest Roads 4228 and 4632 provide easy access to the south and east boundaries. Some woodcutting activities have occurred in these areas.

## Attractions

The major attractions within the RA include the small streams, virgin forests, and wildlife.

Easy access and excellent snow depth make limited portions of the area attractive to winter users.

## CAPABILITY

### Manageability and Boundaries

The ability to manage an area as undeveloped is a considreration. Factors such as size, shape, and juxtaposition relative to external influences are important.

The intensive recreational development along the Cascade Lakes Highway will affect the manageability of the RA. The traffic noise and the general high level of activity would detract from an undeveloped recreation experience.

Forest Roads 4228 and 4632 affect the manageability in both positive and negative ways. The road provides adequate opportunity for transportation access and traveler transfer facilities such as trailheads. Conversely, experience has shown that jeep roads and snowmobile routes adjacent to undeveloped areas often require policing and signing in order to retain the undeveloped character. Areas along this road have received some resource damage by off-road vehicle use in undesignated areas.

### Natural Integrity

The vast majority of the RA is in a natural state and unaffected by human influences.

The trail systems have a high effect upon the immediate area.

Slash burning around the RA does produce some air pollution for short periods of time, but it has not affected natural processes within the RA.

The natural process has been most heavily affected by the control of wildfire in the area. The ecology and natural succession has been altered by the exclusion of fire.

### Apparent Naturalness

Of the human-caused effects discussed in the previous section, the trails will have the greatest influence on the apparent naturalness as perceived by the user. This only affects a very minor portion of the area.

### Opportunities for Solitude

The opportunity for solitude considers the following factors: size of area, topographic screening, vegetative screening, distance from perimeter to core, and human intrusions. Overall the area has limited potential to provide solitude beceause of its narrowness and the fact that it is adjacent to developed areas.

## Primitive Recreation Opportunities

The same factors used for rating solitude plus the following are used for rating primitive recreation: diversity of opportunities, challenge, and absence of facilities. The overall capability to provide for Primitive Recreation is low for the same reason that opportunity for solitude are low.

The opportunities that do exist include hiking, backpacking, camping, hunting, ski touring, horseback riding, photography, nature study, viewing outstanding scenery, and acquiring general knowledge and understanding.

## Challenging Experiences

This attribute considers the areas ability to offer opportunities for unusual adventure, excitement, challenge, self-reliance, initiative, and judgment. Challenging features include such things as dangerous animals, climatic disturbance, avalanche potential, terrain features (i.e., cliffs, quicksand, sink holes), fast-moving water, glaciers, and a lack of dominant visual features on which to orient oneself. This area has few hazardous features.

## Special Features

There have been occasional sightings of peregrine falcons in and near the area. The peregrine is Federally listed as an endangered species. The area is not suitable nesting habitat but could possibly used for hunting prey. There have been reports of wolverines in and near the area also. It is classified as a sensitive species by the Regional Forester. Plants that are classified as sensitive which have been reported in the area are Peck's milkvetch (Asrtagulus peckii), Newberry's gentian (Gentiana newberri), and Suksdorf's (Silene suksdorfii).

## Historic and Scientific Study

The remaining portion of this RA receives an "infrequent" rating for the geological and ecological features present. This rating is given to features found throughout the High Cascade physiographic province.

## Availability and Resource Potential

Refer to Table C-1.

## Management Considerations

Where there are lodgepole pine stands, the mountain pine beetle has infested them at, or near, epidemic levels on the Forest for several decades. Entomologists have predicted that this epidemic will continue for another 10 to 15 years until the beetle's major food supply of lodgepole pine is either consumed or made unavailable. In the southern portion of the Roadless Areas this activity may be setting the stage for a catastrophic fire.

## NEED

### Nearby Wilderness and Its Use

The Three Sisters Wilderness (94,247 acres on Deschutes National Forest) is the nearest Wilderness and is located adjacent to the northern boundary. It is currently being used at about 35 percent capacity.[2]

Statistics for fiscal year 1983 indicates use for the Deschutes portion of the Three Sisters Wilderness was 48,900 RVD's.[2] About 30 percent of the use came from local use, about 55 percent from other in-State locations, and about 15 percent from out of State.

In considering local use, Deschutes County, with a population of 63,300 in 1983, represents the majority of the Forest Influence Area.

### Distance from Population Centers

The Forest Influence Area includes the following towns: Sisters, Redmond, Tumalo, Bend, Sunriver, LaPine, Crescent, and Gilchrist. All of these are within 60 miles of the Three Sisters Wilderness. Bend, with the largest population (17,840), is 25 miles from the Wilderness by road. This distance is not excessive for people interested in a wilderness experience.

### Ecosystem Representation

No rare or unique ecosystems are known to exist within the RA.

### Congressional and Proponent Interest

In February of 1983, the Three Sisters RA was included in the proposed Wilderness Bill H.R. 1149. This bill was not enacted. Most of the original roadless area evaluated in the RARE II process was included as Wilderness in the Oregon Wilderness Act of 1984. The Congressional Review of roadless areas within the National Forests in Oregon did not include this area within the 1984 Wilderness Legislation (P.L. 98-328).

### Public Input

During the RARE II evaluation process, the Forest Service requested public comment. These comments were than analyzed to determine the preferred treatment of the RA's by people in the private sector. The results showed that 74 percent of the respondents wanted wilderness designation, while 26 percent wanted nonwilderness designation.

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[2] 1983 RIM Data.

[3] This data based on analysis of 1981 wilderness permits for the Three Sisters Wilderness Area.

## Other Public Scoping Results

Two public workshops were held to discuss Roadless Areas in early 1984. Public comments were also requested through the "Forest Plan Report." With the exception of some areas with a history of snowmobile use, there was high interest in designating the area as Wilderness. The 1984 Oregon Wilderness Bill included the majority of the area as Wilderness and no comments were forthcoming on the remainder of the area.

# WALDO ROADLESS AREA
## (RARE NO. 6106)

## DESCRIPTION - THE EXISTING CONDITION

### History

The Waldo Roadless Area (RA) was included in the RARE I and RARE II analysis processes. The primary changes occurred in 1983 when approximately 33 acres of the Applejack Sale near Cultus Lake were excluded from the RA. This area was originally logged during the Lucky Sale in 1973. These areas were excluded based on the premise that logging activities are inconsistent with Roadless Area values. Passage of the Oregon Wilderness Act of 1984 added all but a small portion of the RA near Cultus Lake and the Three Sisters Wilderness. This description pertains to the remaining portion.

### Location and Access

The Waldo Roadless Area now contains 4,992 acres and lies within the following township:

T. 20 S., R. 7 E.,W.M.

The area is located adjacent to the north, south, and west shores of Cultus Lake, in the Bend District of the Deschutes National Forest, Deschutes County, Oregon.

Access is gained by traveling west from Bend, Oregon, on Highway 46 for 45 miles, then on Forest Road 4635 to Cultus Lake.

Approximately 8 miles of trail are located within the RA. The following trails pass through the area: No. 6 and No. 15.

### Geography and Topography

The topography of the RA is hummocky and slopes gently to the east. The area contains two lakes and several small streams.

The elevation ranges from 6200 feet on the flank of Cultus Mountain to 4700 feet near Cultus Lake.

Precipitation ranges from 35 to 50 inches per year and falls primarily in the form of snow. The snow usually melts out by late June or early July. The porous volcanic soils cause most of the moisture to soak directly into the ground. Very little runoff occurs. Wet meadows are scattered throughout the RA.

### Soil Types

The soil types described here are based on the Deschutes National Forest Soil Resource Inventory.[1]

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[1] Daniel H. Larsen, Soil Resource Inventory, Deschutes National Forest, Pacific Northwest Region, 1976.

The soils are the high elevation type with a shallow to moderately deep, sandy brown Maxama ash over a stony glacial till or glacial scoured bedrock. Numerous natural depressions contain lakes or meadows. Talus and rock outcrops are common on steep slopes. A bleached gray layer occurs in the surface soils under mountain hemlock.

| Land Type | Landform | Percent Slope | Elevation |
|---|---|---|---|
| 5 | Wet Meadows | 0-30 | |
| 12 | Talus Slopes | 20-70 | |
| 16 | Sloping Uneven Glaciated Lands | 15-70 | 4300-6500 |
| 17 | Gentle Uneven Glaciated Lands | 0-30 | 4200-6500 |
| 19 | Glaciated Uplands | <20 | 4700-6000 |
| 20 | Glaciated Uplands w/Many Lakes | 0-30 | 5300-6000 |
| 22 | Glaciated Moraines & Valley Walls | 25-60 | 5300-6000 |
| 25 | Uneven Glaciated Lands | 10-40 | 4400-5400 |
| 69 | Steep Side Slopes & Ridges | 30-60 | 4500-5800 |

## Vegetation

The plant communities present in the Deschutes portion of the RA include mountain hemlock/grouse huckleberry, lodgepole pine/grouse huckleberry, mixed conifer/manzanita, lodgepole pine/manzanita, mixed conifer snowbrush/sedge, and wet meadows.

Lodgepole pine stands are infested by the mountain pine beetle to endemic proportions. This condition will probably worsen. Lodgepole pine comprises about 10 percent of the forest.

## Ecosystem Type

The RA is predominantly mixed conifer forest, with a ponderosa pine, white fir, red fir, and Douglas fir composition on Cultus Mountain, and white fir/red fir/lodgepole pine mixtures further west and north. Mountain hemlock forests are minutely represented on the west side of the RA. Lodgepole pine stands account for less than one-quarter of the RA. Englemann spruce bottomlands comprise 1 percent or less.

Wet meadows are essentially the only nonforested ecosystems, making up less than 1 percent of the RA.

Overmature ("old-growth") and mature successional stages of forest types, specified above, dominate the area. The only early-successional stages are found in a wildfire burn on the east slope of Cultus Mountain, where grass-forb and shrub-seedling stages are represented.

Wildlife species present are typical of represented ecosystems. Species favoring early successional stages are not abundant here.

### Big Game

The area is summer range for mule deer of the Fort Rock and Upper Deschutes Game Management Unit deer herds that winter from Silver Lake north to Cabin Lake, and along the Deschutes River.

A few elk also summer in the area on the west side of theh RA. While exact wintering ranges have not been confirmed, it is suspected that these elk move westward over the Cascade Divide to sites on the Willamette National Forest.

### Endangered, Threatened, and Sensitive Species

No Federally-listed endangered or threatened species (wildlife, fish, plants) are known to reside in or use the area. The large trees on the east flanks of Cultus Mountain are suitable for winter roost sites for bald eagles that winter on the north end of Crane Prairie but no known activity has yet been documented.

Regional Forester-designated sensitive species known in the RA include the spotted owl and wolverine. A pair of adult spotted owls were observed on the lower east slope of Cultus Mountain in 1983 and 1984, and single birds have been sighted there as far back as 1973. It is thought that this vicinity supports a nesting pair and probably has at least since 1973. The mixed conifer forests on Cultus Mountain are probably the only suitable habitat for spotted owls in the RA.

A wolverine was reported in the Many Lakes Basin (the west half of the RA) in 1972.

No systematic surveys for sensitive plants has been implemented in the RA and no species are known to occur there.

### Fisheries

Deer Lake, accessible by primitive road because of its location on the edge of the RA, is the only fish-producing lake in the RA. It is approximately 55 acres in size and relatively deep at 20 feet. Brook trout and rainbow trout are stocked by the Oregon Department of Fish and Wildlife. Cultus and Little Cultus Lake border just outside the RA.

### Current Uses

Approximately 50 percent of the RA is allocated to the Dispersed Recreation, Unroaded Option; about 7 percent is allocated to the Old Growth option; and the remaining 43 percent is visual management. The two Old Growth areas lie just west of Little Cultus Lake and on the east flank of Cultus Mountain.

The Recreation Opportunity Spectrum (ROS) inventory category is "Semiprimitive Motorized". Primary recreation uses are hiking, horseback riding, fishing, hunting, and snowmobiling along the southern boundary. For fiscal year 1983, the area received 1,500 recreation visitor days (RVD's) for horseback riding, 2,500 RVD's for hiking, 500 RVD's for snowmobiling, and 1,000 RVD's for fishing.

## Appearance

The RA appears as a hummocky country with a dense, mixed conifer forest. It is characterized by small lakes, potholes, and wet meadows. Rock outcroppings are common throughout the area. Cultus Mountain is the predominate landform.

## Surroundings

The RA is bounded on the north and west by the Three Sisters Wilderness which is protected under the Wilderness Act of 1964. This area is further discussed in the "Need" section.

The RA is bounded to the east by Road ______. The road corridor is allocated to Dispersed Recreation, Roaded. This option is the same as Dispersed Recreation, Unroaded except that low standard roads are allowed. This road is basically a track and use is low.

Most of the area to the east is allocated to the Visual Management Option. Cultus Lake lies along this eastern boundary. This Lake and the associated recreational development have the greatest influence upon the RA. They receive intensive recreational use during the summer season. Uses include fishing, camping, waterskiing, wind surfing, and boating. Three campgrounds and a resort are located in the occupancy zone adjacent to the Lakes. Recreation use for these areas totaled 33,5000 RVD's in fiscal year 1983.

## Attractions

Major attractions within the Roadless Area include the many small lakes, wet meadows, scenery, natural forest, and wildlife.

The summit of Cultus Mountain offers panoramic views of the surrounding region.

## CAPABILITY

## Manageability and Boundaries

The ability to manage an area as unroaded must be considered in the context of such factors as size, shape, and location.

Intensive motorized recreational use on Cultus Lake will affect the manageability of the RA. Noise created by motorboats and the high level of activity would detract from an undeveloped recreation experience. This effect decreases proportionately to the distance traveled away from Cultus Lake.

The jeep road along the southern boundary affects the manageability in both positive and negative ways. The road provides adequate opportunity for transportation access and trailheads. Conversely, jeep roads adjacent to undeveloped areas often require policing and signing.

The eastern boundary presents a management problem because it is somewhat irregular and would require extensive posting or signs in order to be easily recognized.

### Natural Integrity

The majority of the RA is in a natural state and unaffected by human influences.

The trail systems are fairly extensive and have a significant effect upon the area adjacent to the trails. Away from the trails, the impact involved is insignificant. The impact could be corrected by discontinuing use and allowing time to heal the scars.

Slash burning around the RA produces air pollution for short periods of time, but it has not affected natural processes within the RA.

Several undeveloped campsites are located around the lakes.

Fish planting has disrupted the natural processes in the lakes.

The natural processes have been most heavily affected by the suppression of wildfire in the area. The ecology and natural succession have been altered by the exclusion of fire.

### Apparent Naturalness

Of the human-caused effects discussed in the previous sections, the trails and the undeveloped campsites have the greatest influence on the apparent naturalness as perceived by the user. The overall influence of this on the entire area low.

### Opportunities for Solitude

The opportunity for solitude considers the following factors: size of area, topographic screening, vegetative screening, distance from perimeter of core, and human intrusions. Overall, the opportunity for solitude is limited because of the small size of the area and the activities that occur to the south and east of the area.

### Primitive Recreation Opportunities

Solitude plus the following additional factors are used for rating primitive recreation: diversity of opportunities, challenge, and absence of facilities. The overall opportunity for primitive recreation is limited due to the area's small size.

Existing opportunities include hiking, fishing, nonmotorized watercraft use, swimming, backpacking, camping, hunting ski touring, horseback riding, photography, nature study, and acquiring general knowledge and understanding.

### Challenging Experiences

This attribute considers the RA's ability to offer opportunities for unusual adventure, excitement, challenge, self-reliance, initiative, and judgment. Challenging features include such things as dangerous animals, climatic disturbance, avalanche potential, terrain features (i.e., cliffs, quicksand, sink holes), fast-moving water, glaciers, and a lack of dominant visual features on which to orient oneself. This area has few hazardous features since it is gentle terrain with small lakes and streams.

### Special Features

No Federally-listed endangered or threatened species are known to reside in or use the RA. The large trees on the east flank of Cultus Mountain are suitable winter roost sites for the bald eagles (threatened) that winter on the north end of Crane Prairie Reservoir, but no activity is occurring at the present time.

The spotted owl is the only known Regional Forest-designated sensitive animal species known to reside in the RA. The mixed conifer forests on Cultus Mountain are probably the only suitable habitat for spotted owls. Wolverines have been sighted near the area.

One unusual plant occurs in the RA, the Sundew (Drosera anglica). It is unique in that it entraps and digests small insects, though it is not a protected species. It is found in bogs and wet meadows.

### Historic and Scientific Study

The Deschutes portion of the RA received an "outstanding" rating for its geological and ecological features. This rating is given to features not found elsewhere in the Western Cascades physiographic province. The small lakes, vegetative types, and rock formations provide a special opportunity for outdoor education and scientific study.

### Availability and Resource Potentials

Refer to Table C-1.

### Management Considerations

The mountain pine beetle have infested lodgepole pine stands to epidemic levels on the Forest. Entomologists predict this epidemic will continue for another 10 to 15 years until the beetle's major food supply of lodgepole pine is either consumed or destroyed. In Roadless Areas, this activity may be setting the stage for a catastrophic fire.

NEED

### Nearby Wilderness and Its Use

The Three Sisters Wilderness (94,247 acres on Deschutes National Forest) is the nearest Wilderness and is located adjacent to the northern boundary. It is currently being used at about 35 percent capacity.

Statistics for fiscal year 1983 indicate use for the Deschutes portion of the Three Sisters Wilderness was 48,900 RVD's.[2] About 30 percent of the use came from local use, about 55 percent from other in-State locations, and about 15 percent from out of State.[3]

In considering local use, Deschutes County, which had a population of 63,300 in 1983, represents the majority of the Forest Influence Area.

### Distance From Population Centers

The Forest Influence Area includes the following towns: Sisters, Redmond, Tumalo, Bend, Sunriver, LaPine, Crescent, and Gilchrist. All of these are within 60 miles of the Three Sisters Wilderness. Bend, with the largest population (17,840), is 25 miles from the Three Sisters Wilderness by road. This distance is not excessive for people interested in a wilderness experience.

### Ecosystem Representation

No rare or unique ecosystems are known to exist within the RA. The combinations of meadows and lakes do make it somewhat unusual, however.

### Congressional and Proponent Interest

In February or 1983, the Waldo RA was included in proposed Wilderness Bill H.R. 1149 but the bill was not enacted into law. With the passage of the Oregon Wilderness Act of 1984, all but a small portion of the RA near Cultus Lake was added to the Three Sisters Wilderness. The remaining portion was not included in the Wilderness because of manmade developments or irregular boundaries that would be hard to manage.

### Public Input

The RARE II evaluation process showed that 20 percent of the respondents wanted wilderness designation, while 80 percent wanted nonwilderness designation.

### Other Public Scoping Results

Two public workshops were conducted on Roadless Areas early in 1984. Public comments were also requested through the "Forest Plan Report." The preponderance of comments wanted the RA retained as undeveloped or Wilderness. Since much of the RA was included as Wilderness in the Oregon Wilderness Act of 1984, no comments have been received on the remainder of the area.

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[2] 1983 RIM Data.

[3] This data based on analysis of 1981 Wilderness permits for the Three Sisters Wilderness.

# WEST AND SOUTH BACHELOR ROADLESS AREA
## (RARE NO. 06195)

## DESCRIPTION - THE EXISTING CONDITION

### History

The West and South Bachelor Roadless Area (RA) was included in both the RARE I and RARE II analysis process. Some boundaries have changed since 1979. Several minor adjustments were made along the northern boundary to exclude roads, developed recreation sites, and a cinder quarry. The western boundary was adjusted to exclude the Quinn Meadow Horse Camp and related improvements. The eastern boundary was adjusted to exclude a portion of Forest Road 45, a paved road from Sunriver to Mt. Bachelor.

These portions were excluded based on the premise that roads and other human developments were inconsistent with Roadless Area values.

### Location and Access

The West and South Bachelor RA contains 30,945 acres and lies within portions of the following townships:

T. 18 S., R. 8 E., W.M.
T. 19 S., R. 8 E., W.M.
T. 18 S., R. 9 E., W.M.
T. 19 S. R 9 E., W.M.

The RA occupies the south and west slope of Mt. Bachelor on the Bend District of the Deschutes National Forest, Deschutes County, Oregon.

The RA can be reached by traveling west from Bend, Oregon, on Highway 46 (the Cascade Lakes Highway) for about 25 miles.

There are about 20 miles of trail within the RA. The following trails pass through the area: No. 1, No. 31, and No. 99.

### Geography and Topography

The topography of the RA ranges from steep to gentle forested terrain. Buttes, lava outcrops, and small lava flows are common. Mt. Bachelor is the most prominent feature. Portions of Hosmer and Sparks Lakes are within the RA.

Precipitation ranges from 30 to 45 inches per year and falls primarily in the form of snow. The snow usually melts by late June or early July. The porous volcanic soils causes most of the moisture to soak directly into the ground, and very little runoff occurs. Quinn Creek is the only perennial creek in the area.

## Soil Types

The soil types are based on the Deschutes National Forest Soil Resource Inventory.[1]

Soils are mid to high elevation types which vary by topographic position. The flat rough lava flows are covered with a shallow surface layer of sandy brown Mazama ash. Most of the soil is filtered deep into the cracks of the lava. The toeslope positions are a moderately deep soil with a sandy brown Mazama ash surface over a stony glacial till or talus material. The steeper sideslopes are a shallow sandy ash over talus or bedrock. A bleached grey soil occurs in the surface soils under mountain hemlock stands. Rock outcrops are common in the lava flow flats or steep slopes.

| Land Type | Landform | Percent Slope | Elevation |
|---|---|---|---|
| 74 | Rough Lava Flows | 0-10 | 4700-6000 |
| 84 | Dissected Sideslopes | 30-80 | 6000-7000 |
| 85 | Toeslopes and Ridges | 0-30 | 5400-6000 |

## Vegetation

Plant communities present are: mountain hemlock/grouse huckleberry, lodgepole pine/grouse huckleberry, mixed conifer/manzanita, lodgepole pine/manzanita, mixed conifer/snowbrush/sedge, mixed conifer/snowberry/forb and lodgepole pine/sedge-needlegrass basins.

The mountain pine beetle infestation is becoming increasingly evident in the lodgepole pine communities.

## Ecosystem Type

About 95 percent of the area is forested. The predominant type, mountain hemlock, comprises over half of the area. Mixed conifer forest accounts for about 33 percent of the area; lodgepole pine forest and ponderosa pine each make up less than 5 percent. The ponderosa pine is located in the east end at Edison Butte. Lodgepole occurs in widely scattered patches. Forested stands are generally in either "old growth" or "mature" successional stages.

The nonforested portions of the area are either cinder cones or moist meadows. Katsuk Butte is identified as a good representation of an undisturbed high-elevation forested cinder cone.

Riparian ecosystems occur along the Quinn and Sink Creek drainages. Moving upstream from the open meadows of Hosmer Lake, these riparian plant communities are narrow forested strips dominated by lodgepole pine, subalpine fir, and mountain hemlock with a grass/forb ground cover. No shrubs are present.

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[1] Daniel H. Larsen, Soil Resource Inventory, Deschutes National Forest, Pacific Northwest Region, 1976.

Mule deer belonging to the Upper Deschutes Herd Management Unit summer in the area. These deer come from the Tumalo and North Paulina winter ranges. Generally, the mountain hemlock forests support relatively low deer densities because of limited availability and quality of forage. More use occurs along the riparian and meadow ecosystems.

Roosevelt elk summer near the riparian ecosystems and on the eastern end of the area.

Sparks Lake and Hosmer Lake lie partially inside the area. Sparks Lake is 600 acres and Hosmer is 250 acres in size. Both are less than 10 feet deep. Sparks Lake is a good brook trout fishery. Hosmer Lake is nationally known for its Atlantic salmon fishery. Both lakes offer scenic vistas that give them extraordinary qualities.

### Current Uses

The primary use is dispersed recreation. The Recreation Opportunity Spectrum (ROS) inventoried category is Semiprimitive Nonmotorized with the exception of the lakes. The eastern third of the area is Semiprimitive Motorized during the winter. The entire area is open to snowmobiles on the Off-Road Vehicle (ORV) plan. Recreation uses are hiking (350 RVD's), horseback riding (100 RVD's), dispersed camping (14,057 RVD's), fishing (1,500 RVD's), hunting (100 RVD's), nordic skiing (12,564 RVD's), viewing scenery (8,263 RVD's), spelunking (100 RVD's), snowmobiling (2,899 RVD's), and bicycling (90 RVD's).

As of March 1985, geothermal leases have been filed on some 35 to 40 sections in the RA.

The Mt. Bachelor Ski Area has a cleared and signed catch line around the base of Mt. Bachelor. The permit area is not included in a roadless area.

### Appearance

The terrain varies from flat forested terrain on the west side of the RA to steep slopes on Mt. Bachelor and Kwolh Butte. Small lava flows occur throughout the area. With the exception of the two lakes, very little water is present. Most of the area is densely forested, but it does not offer a great variety of vegetation. Mt. Bachelor is the dominant landform.

Mountain pine beetle has infested the lodgepole pine stands, which is affecting the scenic quality of the RA.

### Surroundings

The northern half of Mt. Bachelor is under special-use permit to the ski resort, Mt. Bachelor, Inc., one of the most popular downhill ski areas in the Pacific Northwest. It has a present capacity of 12,000 Persons At One Time (PAOT). The resort plans to expand to 23,000 PAOT under the approved master plan. Recreational use totaled 283,300 RVD's for 1983.

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The proximity of the Cascade Lakes Highway and associated recreational development tend to have a great effect upon the RA. Recreational use in the adjacent developed sites totaled 110,600 RVD's in fiscal year 1983. Eleven campgrounds, 4 picnic sites, 32 summer homes, 1 horse camp, and 2 resorts are located in the occupancy zone adjacent to the lakes. The resort at Elk Lake remains open year round to serve recreationists.

Lands to the south and east are managed primarily for wood and forage production. Logging activities are prevalent. Other uses include firewood cutting and snowmobiling.

A paved road from Sunriver to Mt. Bachelor (Forest Road 45) follows the eastern boundary for a short distance.

Cinder quarries exist at Red Crater and opposite Todd Lake junction.

### Attractions

Major attractions within the RA include Mt. Bachelor, Hosmer and Sparks Lakes, and many lava caves, wildlife, and scenery. Easy access and excellent snow depth make the area attractive to winter users. The summit of Mt. Bachelor offers panoramic views of the Cascades and the surrounding area.

## CAPABILITY

### Manageability and Boundaries

The ability to manage an area as roadless must be considered before a recommendation can be made. Factors such as size, shape, and location are important.

The intensive recreational development along the Cascade Lakes Highway will affect the manageability of the RA. Traffic noise and high level of activity would detract from a primitive recreation experience.

The southern and eastern boundaries present a management problem because they are irregular and do not follow clear topographic or geographic lines. The boundary would require extensive posting in order to be easily recognized.

Existing roads offer adequate opportunity for transportation access and trailheads.

The existing trail system adequately serves the area.

The mountain pine beetle infestation may be setting the stage for a catastrophic fire in lower elevations.

### Natural Integrity

The vast majority of the RA is in a natural state and unaffected by human influences.

The trail system has a heavy impact upon the immediate area.

Slash burning around the RA produces air pollution for short periods of time but, overall, has not affected natural processes within the RA.

Fish planting has disrupted the natural processes in the lakes.

Some undeveloped campsites are located around the lakes.

Two historic cabins are located within the RA.

Vegetative clearing has been done along the Mt. Bachelor catch line.

The natural processes have been most heavily affected by wildlife suppression in the area.

### Apparent Naturalness

The trails, undeveloped campsites, and catch line will have the greatest influence on the apparent naturalness as perceived by the user, but this only affects a very small percentage of the area.

### Opportunities for Solitude

The opportunity for solitude is based on the following factors: size of area, topographic screening, distance from perimeter to core, and human intrusions. Overall the area can provide for solitude except for the sounds of civilization near the developed recreation areas and busy highways.

### Primitive Recreation Opportunities

Solitude and the additional factors are used for evaluating primitive recreation: diversity of opportunities, challenge and absence of facilities. The interior of the area can provide for primitive recreation but the edges are influenced by development and human activity.

Existing opportunities include hiking, fishing, nonmotorized watercraft use, swimming, backpacking, camping, hunting, ski touring, horseback riding, photography, nature study, viewing outstanding scenery, and acquiring general knowledge and appreciation for nature and the environment.

### Challenging Experiences

This attribute is based on the RA's ability to offer opportunities for unusual adventure, excitement, challenge, self-reliance, initiative, and judgment. Challenging features include dangerous animals, climatic disturbance, avalanche potential, terrain features (i.e. cliffs, quicksand, sink holes), fast-moving water, glaciers, and a lack of dominant visual features on which to orient oneself. A few hazardous features present are not common in the area.

### Special Features

No Endangered or Threatened species are known or suspected to occur in the area. One Sensitive species--the Newberry's gentian (Gentiana newberryi)-- is recorded at Sparks Meadows (1976) and may occur in the meadows around Hosmer Lake.

### Historic and Scientific Study

The West and South Bachelor RA receives a "unique" rating due to the presence of the cultural, geological, and ecological features of which there are few known occurrences.

These features include historical cabins, lava caves, threatened or endangered species, and scenery.

### Availability and Resource Potential

Refer to Table C-1.

### Management Considerations

The mountain pine beetle infestation has reached epidemic proportions in the lodgepole pine stands. Entomologists predict that this epidemic will continue for another 10 to 15 years until the beetle's major food supply of lodgepole pine is either consumed or destroyed. In Roadless Areas, this infestation may be setting the stage for a catastrophic fire. Wilderness designation might preclude treating these fuels by normal methods, thus reducing fire hazard.

## NEED

### Nearby Wilderness and Its Use

The Three Sisters Wilderness located north and west of the area (94,247 acres on Deschutes National Forest) is the nearest Wilderness. It is currently being used at about 35 percent capacity.

Statistics for fiscal year 1983 indicate use of the Deschutes portion of the Three Sisters Wilderness was 48,900 RVD's. About 30 percent of the use came from the local area, about 55 percent from other in-State locations, and about 15 percent from out-of-State.

In considering local use, Deschutes County represents the majority of the Forest Influence Area. The population of the County was 63,300 in 1983.

### Distance From Population Centers

The Forest Influence Area includes the following towns: Sisters, Redmond, Tumalo, Bend, Sunriver, LaPine, Crescent, and Gilchrist. All of these are within 100 miles of the Wilderness. Bend, with the largest population (17,840), is 25 miles from the Wilderness by road. This distance is not excessive for people interested in a wilderness experience.

[2] 1983 RIM Data.

[3] This data based on analysis of 1981 wilderness permits for the Three Sisters Wilderness Area.

## Ecosystem Representation

No rare or unique ecosystems are known to exist within the RA.

## Congressional and Proponent Interest

There has been no congressional interest in the RA, with some interest by proponents of wilderness in the private sector.

## Public Input

The RARE II evaluation process showed that 73 percent of the respondents wanted wilderness designation, while 27 percent wanted nonwilderness designation.

## Other Public Scoping Results

Two public workshops were held on Roadless Areas in early 1984. Public comments were also requested through the Forest Plan Report. The comments slightly favored development or partial development of the area.

## AVAILABILITY - OTHER RESOURCE POTENTIALS

| | Mt. Jefferson RA | Metolius Breaks RA | Three Sisters RA | W&S Bachelor RA | Bear Wallows RA | Bend Watershed RA |
|---|---|---|---|---|---|---|
| Recreation Special Values | None | Castle Rocks | None | Lava Tube Caves | None | Bridge Creek Spring |
| Current Uses | Hiking, horseback riding, hunting, dispersed camping, snowmobiling | Hiking, horseback riding, hunting, dispersed camping | Hiking, horseback riding, hunting, dispersed camping, snowmobiling | Hiking, horseback riding, dispersed camping fishing, hunting cross-country skiing, spelunking, snowmobiling, viewing scenery | Hunting | Hiking, horseback riding, hunting, dispersed camping, cross-country skiing, snowmobiling |
| Potential Uses | Cross-country skiing, nature study | Nature study, photography, viewing scenery | Cross-country skiing | Alpine skiing, bicycling | Hiking, backpacking, ski touring, horseback riding | Bicycling |
| Water | Small streams exist, there is no potential for enhancement or development. | One small stream, some potential for erosion abatement in steep portions. | Two small streams, no potential for enhancement. | Portions of Hosmer and Sparks Lakes. Potential exists to further develop both lakes for recreation. | No water and no potential. | The two streams are main water supply for the City of Bend. There is potential for more intense protection management of the watershed. |
| Wildlife | | One bald eagle nesting site w/ three nests. Some potential for enhancement of turkey habitat and big game habitat (i.e., planting oak, prescribe burning, etc.) | | | | |
| Livestock | Limited potential. Densely forested, some steep ground. Logging might increase openings and forage. | No potential. Steep ground and very little water. | Limited potential, densely forested. Logging might increase openings and forage. | Limited potential. Water is located near developed recreation areas. The RA is generally densely forested and rocky. | No potential. Densely forested. Logging might increase openings and forage. | No potential. Municipal Watershed. |
| Ecological | | Some potential for protecting bald eagle site from mountain pine beetle damage. | No special ecological considerations or potential. | | | |

| | Mt. Jefferson RA | Metolius Breaks RA | Three Sisters RA | W&S Bachelor RA | Bear Wallows RA | Bend Watershed RA |
|---|---|---|---|---|---|---|
| Mineral & Energy | No minerals. Moderate geothermal potential, 5 to 20 kw per acre, one valid lease. | No minerals. Limited geothermal potential due to steep terrain. No leases. | No minerals. Moderate geothermal potential, 5 to 20 kw per acre. No leases. | No minerals. Moderate geothermal potential, 5 to 20 kw per acre. No leases. | No minerals. Good potential for geothermal energy, 20 to 70 kw/acre. No leases. | No minerals. Good potential for geothermal energy, 20 to 70 kw/acre. Development might conflict with watershed management. |
| Special Uses<br>Other uses such as pipelines, highways, electronic sites, etc. | None. | None. | None. | None. | None. | Small diversion dam and connecting ditch exist as part of Bend water supply. Outfitter guides operate under special-use permits. |
| Suitable Forest Land & Site Species | | | | | | |
| Pon. Pine | 154 | 2,768 | 392 | 1,167 | 117 | 0 |
| LP Pine | 213 | 0 | 3,800 | 665 | 4,495 | 352 |
| Mix. Con. | 2,144 | 5,396 | 2,512 | 9,289 | 2,645 | 6,827 |
| Mtn. Hem. | 0 | 0 | 678 | 12,976 | 80 | 5,429 |
| Unsuitable Land | 0 | 1,169 | 74 | 3,759 | 0 | 213 |
| Nonforest | 96 | 1,574 | 859 | 3,813 | 0 | 1,429 |
| Stand Age Classification | | | | | | |
| Ponderosa Pine | | | | | | |
| Regen. | 0 | 11 | 0 | 5 | 0 | 0 |
| Seedlings & Saps. | 53 | 336 | 0 | 0 | 0 | 0 |
| Immature Sawtimber | 0 | 208 | 0 | 69 | 0 | 0 |
| Mature Sawtimber | 101 | 2,213 | 392 | 1,093 | 117 | 0 |
| Lodgepole Pine | | | | | | |
| Regen. | 0 | 0 | 0 | 0 | 5 | 32 |
| Seedlings & Saps. | 0 | 0 | 0 | 90 | 0 | 0 |
| Immature Sawtimber | 0 | 0 | 0 | 261 | 0 | 0 |
| Mature Sawtimber | 213 | 0 | 3,800 | 314 | 4,490 | 4,320 |

|  | Mt. Jefferson RA | Metolius Breaks RA | Three Sisters RA | W&S Bachelor RA | Bear Wallows RA | Bend Watershed RA |
|---|---|---|---|---|---|---|
| Mixed Conifer |  |  |  |  |  |  |
| Regen. | 0 | 352 | 32 | 171 | 5 | 592 |
| Seedlings & Saps. | 288 | 533 | 0 | 0 | 0 | 342 |
| Immature Sawtimber | 192 | 202 | 0 | 0 | 27 | 101 |
| Mature Sawtimber | 1,664 | 4,309 | 2,480 | 9,188 | 2,613 | 5,792 |
| Mnt. Hemlock |  |  |  |  |  |  |
| Regen. | 0 | 0 | 0 | 123 | 11 | 544 |
| Seedlings & Saps. | 0 | 0 | 0 | 16 | 0 | 0 |
| Immature Sawtimber |  |  |  |  |  |  |
| Mature Sawtimber | 0 | 0 | 678 | 12,837 | 69 | 4,885 |
| Volume |  |  |  |  |  |  |
| Long Term Sustained Yield |  |  |  |  |  |  |

| | Waldo RA | Charlton RA | North Paulina RA | South Paulina RA | Maiden Peak |
|---|---|---|---|---|---|
| Recreation | | | | | |
| Special Values | None | None | Unique geological features. | Unique geological features. | Maiden Peak. |
| Current Uses | Hiking, horseback riding, fishing, hunting, snowmobiling | Hiking, horseback riding, hunting, fishing, dispersed camping. | Snowmobiling, horseback riding, hiking, cross-country skiing. | Snowmobiling, horseback riding, hiking cross-country skiing. | Hiking, horseback riding, dispersed camping, hunting, fishing, cross-country skiing. |
| Potential Uses | Cross-country skiing, nature study, bicycling | Cross-country skiing, bicycling | Nature study, and photography. Bicycling on some trails. | Bicycling on some trails. Nature study & photography. | Bicycling. |
| Water | Two lakes and several small streams. No potential for enhancement | There are several small lakes and streams. There may be potential for additional recreation development of Taylor and Lemish Lakes. | No water within RA. | No water within RA. | Charlton & Bobby lakes and numerous small lakes and streams. Potential exists for additional recreational development of Charlton & Bobby Lakes. |
| Wildlife | | | One bald eagle nesting site. Potential for additional site protection (preventing beetle damage). | | |
| Livestock | No potential. RA is narrow, irregular in shape and lies adjacent to developed recreation area. Some steep ground. | Densely forested, however there may be some potential for use by livestock. Logging might increase openings & forage. | No potential due to lack of water and poor forage. | No potential due to lack of water and poor forage. | Densely forested, however, there may be some potential for use by livestock. Logging might increase openings & forage. |
| Ecological | | | Bald eagle habitat will need protection. | | |
| Mineral & Energy | No minerals. Moderate potential for geothermal energy, 5 to 20 kw/ac. No leases. | No minerals. Moderate geothermal potential, 5 to 20 kw/acre. Leases on 2,500 acres have been applied for. | No minerals. Good potential for geothermal energy, 20 to 70 kw/ac. There are 14 valid leases. | No minerals. Good potential for geothermal energy, 20 to 70 kw/acre. There are 14 valid leases. | No minerals. Moderate geothermal potential, 5 to 20 kw/ac. No leases exist. |

| | Waldo RA | Charlton RA | North Pauline RA | South Pauline RA | Maiden Peak |
|---|---|---|---|---|---|
| Special Uses<br>Other uses such as pipelines, highways, electronic sites, etc. | None | SCS maintains a snow measurement site near Blowdown Lake. There are four designated helispots using natural openings. | None | None | A water diversion device exists on Charlton Lake. There are six designated helispots using natural openings. |
| Suitable for Land and Site Species | | | | | |
| Pon. Pine | 0 | 0 | 128 | 96 | 0 |
| LP Pine | 517 | 1,456 | 8,347 | 3,871 | 1,467 |
| Mix. Con. | 0 | 758 | 1,435 | 1,008 | 3,728 |
| Mtn. Hem. | 677 | 4,448 | 4,107 | 1,731 | 18,784 |
| Unsuitable Land | 864 | 416 | 6,560 | 1,860 | |
| Nonforest | 272 | 165 | 1,045 | 1,349 | |
| Stand Age Classification | | | | | |
| Ponderosa Pine Regen. | 0 | 0 | 0 | 0 | 0 |
| Seedlings & Saps. | 0 | 0 | 11 | 0 | 0 |
| Immature Sawtimber | 0 | 0 | 0 | 0 | 0 |
| Mature Sawtimber | 0 | 0 | 117 | 96 | 0 |
| Lodgepole Pine Regen. | 0 | 0 | 0 | 0 | 0 |
| Seedlings & Saps. | 0 | 0 | 278 | 261 | 0 |
| Immature Sawtimber | 0 | 0 | 53 | 21 | 0 |
| Mature Sawtimber | 517 | 1,456 | 8,016 | 3,589 | 1,467 |
| Mixed Conifer Regen. | 0 | 0 | 0 | 0 | 48 |
| Seedlings & Saps. | 0 | 0 | 11 | 0 | 0 |
| Immature Sawtimber | 0 | 0 | 0 | 0 | 0 |
| Mature Sawtimber | 0 | 758 | 1,424 | 1,008 | 3,680 |

| | Waldo RA | Charlton RA | North Paulina RA | South Paulina RA | Maiden Peak |
|---|---|---|---|---|---|
| Mtn. Hemlock | | | | | |
| Regen. | 0 | 0 | 0 | 0 | 0 |
| Seedlings & Saps. | 0 | 0 | 614 | 0 | 32 |
| Immature Sawtimber | | | | | |
| Mature Sawtimber | 677 | 4,448 | 3,493 | 1,731 | 18,752 |
| Volume | | | | | |
| Long Term Sustained Yield | | | | | |

## ENVIRONMENTAL CONSEQUENCES

### A. General Activities:

The decision to maintain some roadless areas and to develop others has environmental consequences. The effect of this decision varies by alternative depending upon how the roadless areas are managed.

#### 1. Consequences of Alternatives:

In areas that are completely roadless, resources such as wildlife, scenic quality, old growth forest, and unroaded recreation opportunities remain adequately protected. In unroaded areas where some roads are maintained, their impacts on these resources must be considered individually following the management strategies used in other roadless areas discussed in the Forest Plan. For example, because Alternatives C and D emphasize commodities, specific portions of the roadless areas have been designated to protect old growth and wildlife. In contrast, in Alternatives G and H, specific areas have not been identified because there is abundant unroaded recreation areas where these resources are protected.

Several other examples are helpful. In Alternatives D, G, and H, all potential eagle habitat on the Forest is managed for eagles, including in roadless areas. In contrast, Alternative C places minimum emphasis on eagle habitat Forest-wide, as well as in those lands that had been considered roadless areas. Research natural areas are provided in all Alternatives, with the exception of C and D because of their commodity emphasis. They do not occur in Alternative E because of their potential conflict with geothermal development which is emphasized in the alternative.

Alternative G maintains all roadless areas in a roadless condition. Alternative C would retain the fewest acres (4 percent) in a roadless condition. Alternatives B, E, F, and the Current Direction Alternative retain between 40 and 45 percent of the roadless areas. Alternative D has the second lowest amount of roadless areas while Alternative H has the second largest amount. Various alternatives preserve different roadless areas.

Table _______ shows the roadless areas in each Alternative.

## Roadless Area Designation by Management Strategy
Acres by Alternative

| Roadless Area | Management Strategy | Alternatives<br>CD (A) | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|---|
| Mt. Jefferson | Timber production | 1248 | 1370 | 1509 | 1226 | 1370 | 1247 | 0 | 1488 |
| | Scenic | 976 | 784 | 688 | 971 | 784 | 950 | 0 | 709 |
| | Spotted Owl Habitat | 0 | 454 | 411 | 411 | 454 | 411 | 0 | 411 |
| | Undeveloped Recreation | 0 | 0 | 0 | 0 | 0 | 0 | 2491 | 0 |
| | Old Growth | 384 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Total | 2608 | 2608 | 2608 | 2608 | 2608 | 2608 | 2608 | 2608 |
| Metolius Breaks | Timber Production | 512 | 219 | 6806 | 560 | 219 | 219 | 2048 | 2048 |
| | Deer Habitat | 773 | 1595 | 2901 | 1280 | 1595 | 1611 | 0 | 2048 |
| | Scenic | 624 | 0 | 0 | 6208 | 0 | 0 | 416 | 416 |
| | Eagle Habitat | 0 | 368 | 192 | 528 | 368 | 368 | 528 | 528 |
| | Wildlife MMR | 0 | 0 | 203 | 107 | 0 | 0 | 0 | 0 |
| | Developed Recreation | 0 | 811 | 805 | 736 | 811 | 795 | 0 | 0 |
| | Undeveloped Recreation | 0 | 7583 | 0 | 0 | 7583 | 6479 | 7755 | 7755 |
| | Special Interest | 1254 | 331 | 0 | 1488 | 331 | 1435 | 160 | 160 |
| | Old Growth | 848 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Protection Mgmt.(1978 Plan) | 6896 | NA | NA | NA | NA | NA | NA | NA |
| | Total | 10,907 | 10,907 | 10,907 | 10,907 | 10,907 | 10,907 | 10,907 | 10,907 |
| Three Sisters | Timber Production | 4075 | 5206 | 6460 | 5450 | 5206 | 5206 | 0 | 3861 |
| | Scenic | 2091 | 480 | 276 | 486 | 309 | 320 | 0 | 523 |
| | Developed Recreation | 0 | 581 | 736 | 1568 | 752 | 693 | 91 | 331 |
| | Undeveloped Recreation | 1237 | 1648 | 0 | 811 | 1648 | 1653 | 8224 | 3600 |
| | Winter Recreation | 0 | 400 | 843 | 0 | 400 | 443 | 0 | 0 |
| | Old Growth | 272 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Protection Mgmt.(1978 Plan) | 640 | NA | NA | NA | NA | NA | NA | NA |
| | Total | 8315 | 8315 | 8315 | 8315 | 8315 | 8315 | 8315 | 8315 |
| West South Bachelor | Timber Production | 2747 | 0 | 15131 | 5132 | 4437 | 3115 | 160 | 2064 |
| | Scenic | 3339 | 5642 | 0 | 8623 | 4512 | 463 | 1861 | 981 |
| | Eagle Habitat | 0 | 96 | 91 | 91 | 96 | 91 | 91 | 91 |
| | Osprey Habitat | 0 | 0 | 0 | 69 | 0 | 0 | 0 | 0 |
| | Wildlife MMR | 0 | 80 | 608 | 80 | 80 | 59 | 59 | 59 |
| | Developed Recreation | 5344 | 6150 | 7771 | 7862 | 7857 | 7211 | 5547 | 7264 |
| | Winter Recreation | 0 | 6773 | 7248 | 8992 | 12785 | 0 | 0 | 0 |
| | Undeveloped Recreation | 16827 | 12108 | 0 | 0 | 43 | 18966 | 22187 | 19446 |
| | Research Natural Area | 944 | 0 | 0 | 0 | 944 | 944 | 944 | 944 |
| | Old Growth | 480 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Special Interest | 0 | 91 | 96 | 96 | 91 | 96 | 96 | 96 |
| | Protection Mgmt.(1978 Plan) | 1264 | NA | NA | NA | NA | NA | NA | NA |
| | Total | 30,945 | 30,945 | 30,945 | 30,945 | 30,945 | 30,945 | 30,945 | 30,945 |

| Roadless Area | Management Strategy | CD (A) | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|---|
| Bearwallows | Timber Production | 901 | 5790 | 6990 | 6259 | 5790 | 5774 | 1085 | 1085 |
| | Scenic | 149 | 59 | | 736 | 59 | 75 | 145 | 145 |
| | Wildlife MMR | | 251 | 267 | 267 | 251 | 251 | | |
| | Developed Recreation | | 80 | 80 | 75 | 80 | 80 | 0 | 0 |
| | Undeveloped Recreation | 309 | 0 | 0 | 0 | 0 | 0 | 6107 | 6107 |
| | Winter Recreation | 0 | 1157 | 0 | 0 | 1157 | 1157 | 0 | 0 |
| | Old Growth | 240 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Protection Mgmt.(1978 Plan) | 5738 | NA | NA | NA | NA | NA | NA | NA |
| | Total | 7337 | 7337 | 7337 | 7337 | 7337 | 7337 | 7337 | 7337 |
| Bend Watershed | Timber Production | 747 | 2133 | 1920 | 1493 | 475 | 651 | 1275 | 1275 |
| | Scenic | 2090 | 459 | 511 | 5070 | 458 | 817 | 869 | 741 |
| | Wildlife MMR | 0 | 101 | 363 | 267 | 96 | 101 | 5 | 5 |
| | Developed Recreation | 0 | 11 | 11 | 342 | 11 | 11 | 11 | 139 |
| | Undeveloped Recreation | 7770 | 5114 | 0 | 3563 | 5226 | 5166 | 8575 | 8575 |
| | Winter Recreation | 0 | 2368 | 7941 | 0 | 3920 | 3989 | 0 | 0 |
| | Watershed | 3643 | 4064 | 3504 | 3515 | 4064 | 3515 | 3515 | 3515 |
| | Total | 14,250 | 14,250 | 14,250 | 14,250 | 14,250 | 14,250 | 14,250 | 14,250 |
| Waldo | Timber Production | 0 | 112 | 752 | 480 | 112 | 123 | 640 | 528 |
| | Scenic | 1584 | 432 | 0 | 619 | 432 | 422 | 32 | 32 |
| | Eagle Habitat | 0 | 720 | 560 | 789 | 720 | 720 | 795 | 795 |
| | Spotted Owl Habitat | 0 | 784 | 784 | 784 | 784 | 784 | 784 | 784 |
| | Wildlife MMR | 0 | 64 | 192 | 32 | 64 | 43 | 37 | 37 |
| | Developed Recreation | 0 | 240 | 1296 | 1173 | 240 | 715 | 53 | 208 |
| | Undeveloped Recreation | 1888 | 1829 | 1408 | 1115 | 1829 | 1374 | 1840 | 1797 |
| | Research Natural Area | 811 | 811 | 0 | 0 | 811 | 811 | 811 | 811 |
| | Old Growth | 613 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Protection Mgmt.(1978 Plan) | 96 | NA | NA | NA | NA | NA | NA | NA |
| | Total | 4992 | 4992 | 4992 | 4992 | 4992 | 4992 | 4992 | 4992 |
| Charlton | Timber Production | 261 | 64 | 6523 | 5019 | 3530 | 53 | 80 | 80 |
| | Scenic | 363 | 385 | 0 | 1504 | 385 | 385 | 0 | 0 |
| | Wildlife MMR | 0 | 11 | 208 | 208 | 16 | 11 | 0 | 0 |
| | Undeveloped Recreation | 6438 | 6271 | 0 | 0 | 2800 | 6282 | 6646 | 6646 |
| | Research Natural Area | 181 | 512 | 512 | 512 | 512 | 512 | 517 | 517 |
| | Total | 7243 | 7243 | 7243 | 7243 | 7243 | 7243 | 7243 | 7243 |
| North Paulina | Timber Production | 1536 | 757 | 14709 | 811 | 757 | 784 | 0 | 3765 |
| | Scenic | 12625 | 14230 | 0 | 13845 | 14230 | 14192 | 421 | 85 |
| | Eagle Habitat | 0 | 603 | 603 | 603 | 603 | 603 | 603 | 603 |
| | Wildlife MMR | 0 | 144 | 251 | 144 | 251 | 144 | 27 | 27 |
| | Developed Recreation | 0 | 1360 | 1845 | 2021 | 1658 | 5781 | 1013 | 1013 |
| | Undeveloped Recreation | 0 | 4160 | 0 | 4091 | 4016 | 11 | 19451 | 11553 |
| | Winter Recreation | 0 | 261 | 4107 | 0 | 0 | 0 | 0 | 4469 |
| | Special Interest Area | 6746 | 107 | 107 | 107 | 107 | 107 | 107 | 107 |
| | Old Growth | 715 | 0 | 0 | 0 | 0 | | 0 | 0 |
| | Total | 21,622 | 21,622 | 21,622 | 21,622 | 21,622 | 21,622 | 21,622 | 21,622 |

| Roadless Area | Management Strategy | CD (A) | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|---|
| South Paulina | Timber Production | 0 | 800 | 4512 | 165 | 800 | 1360 | 0 | 1157 |
| | Scenic | 4682 | 3707 | 0 | 4298 | 3712 | 3147 | 48 | 48 |
| | Wildlife MMR | 0 | 117 | 123 | 112 | 123 | 112 | 0 | 0 |
| | Developed Recreation | 0 | 2048 | 2150 | 2028 | 2026 | 5296 | 384 | 384 |
| | Undeveloped Recreation | 0 | 0 | 0 | 3312 | 3254 | 0 | 9483 | 8326 |
| | Winter Recreation | 0 | 3243 | 3130 | 0 | 0 | 0 | 0 | 0 |
| | Special Interest | 4965 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Old Growth | 267 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Total | 9915 | 9915 | 9915 | 9915 | 9915 | 9915 | 9915 | 9915 |
| Maiden Peak | Timber Production | 555 | 9152 | 25135 | 16562 | 8757 | 7227 | 448 | 757 |
| | Scenic | 2048 | 875 | 0 | 5881 | 4314 | 2331 | 309 | 0 |
| | Eagle Habitat | 0 | 688 | 683 | 688 | 688 | 726 | 720 | 736 |
| | Osprey Habitat | 0 | 0 | 0 | 315 | 0 | 0 | 341 | 341 |
| | Wildlife MMR | 0 | 224 | 683 | 480 | 224 | 187 | 0 | 0 |
| | Developed Recreation | 0 | 501 | 507 | 389 | 501 | 459 | 336 | 336 |
| | Undeveloped Recreation | 14171 | 15568 | 0 | 2693 | 12524 | 16080 | 24854 | 24830 |
| | Total | 27008 | 27008 | 27008 | 27008 | 27008 | 27008 | 27008 | 27008 |

## 2. Consequences by Resource

### a. Roadless Areas:

Prevailing soil, hydrologic, and atmospheric conditions prevailing within the area would be maintained.

Evidence of man's influence and activities would diminish rather than increase through time. The naturalness, uniqueness, and representative ecosystems of the designated area would be maintained. Educational opportunties for the scientific study of natural ecological processes would increase.

Growth of insect or disease populations within unroaded areas may spread to adjacent lands.

### b. Wilderness:

Additional areas for undeveloped reacreation could reduce the numbers of recreation impact on existing wilderness areas. This may reduce the need to limit the number of wilderness users through administrative closures and wilderness reservations. Most undeveloped recreation are not as popular as those areas already included in Wilderness, so the effect on wilderness may not be significant. Roadless lands adjacent to Wilderness areas would provide a buffer against the sights and sounds of development.

### c. Recreation:

Unroaded areas provide opportunities for solitude, remoteness, primitive experiences, challenge, and unconfined recreation in a natural environment. These values are reduced as the areas are modified or developed.

Dispersed campsites and other heavily used areas may adversely affect soil and water in localized areas. Maintaining a large number of unroaded areas would improve the balance of ROS acres in the Semiprimitive Nonmotorized category.

If the roadless areas are developed timber management activities will change the recreational opportunities available to the Forest visitor. Indirect effects of increased timber management activities are increased opportunities for motorized dispersed recreation and the increased opportunity for winter recreation.

Through the application of appropriate prescriptions and their associated standards and guidelines, vegetative management in developed recreation areas can have the long term effect of improved visual quality for recreation settings.

Dispersed campsites and other heavily used recreation areas may adversely affect soil and water in localized areas.

In areas managed in an unroaded condition, evidence of man's influence and activities in unroaded areas would diminish rather than increase through time. The naturalness, uniqueness, and representative ecosystems, and a high level of visual quality, would be maintained in roadless areas. Educational opportunities for scientific study of natural ecological processes would increase.

d. Timber:

No timber would be available for harvest in the Unroaded Recreation Areas. In the Winter Recreation Areas and Developed Recreation Areas timber harvest would be limited to the amount necessary to meet recreation objectives. Added care and cost would be needed to meet the more restrictive objectives of Visual Management Areas.

In the unroaded areas, plant community diversity will most likely increase, but the Forest's age class diversity would decrease over time. Areas managed for primitive or semiprimitive recreation will eventually reach the climax plant succession stage. In areas designated for scenic quality carefully designed vegetative manipulation, including timber harvest, can be used to enhance or maintain the areas visual quality.

An indirect affect of no timber harvest is a buildup of natural fuels which will increase the risk and severity of fire. The reduced vigor of the trees would also increase the risk of insects and disease.

If roadless areas are developed timber management is one activity that may occur. Timber management is comprised of a number of related silvicultural activities associated with the establishment, tending, harvesting and marketing of wood products from the National Forest.

Silvilcultural activities which affect the environment include site preperation, reforestation, plantation protection against animal damage, timber stand improvement including modification of competitive vegetation and thinning, and the harvesting of timber crops. Other activities that are associated with the management of timbered stands include road construction and maintenance, logging operations, and the removal of residual fuels resulting from harvesting activities.

The magnitude of the effects, both their short-term and long-term, and their direct and indirect is dependent upon the type of activities prescribed and the number of acres to which they are applied.

Road construction associated with timber management represents a long term commitment of Forest resources. Acreage dedicated to road systems is not available for production of trees or forage. Timber harvesting and associated activities will compact soils on skid trails, log landings, and temporary roads. Soil will be displaced in areas where timber is harvested and residues are treated. These consequences will be localized and short-term, and can be mitigated.

Timber management activities will have other long term effects on the timber resource. As the forest is converted from its existing natural stands to managed stands, volume growth will be increased. Also, the younger managed stands will be more vigorous which will result in reduced risks of damage from insect and disease outbreaks. All of these long-term consequences will be realized sooner and to larger extents for alternatives which emphasize higher harvest levels.

Timber management activities will alter the structure and composition of Forest plant communities. Timber harvesting can increase forage production.

Road systems developed for timber management result in increased access to existing roadless areas which are often adjacent to Wilderness Areas. Increased access could change visitor use patterns in these areas. The potential to view and hear timber management activities from the Wilderness and roadless areas could also increase, thereby reducing the total wilderness experience. Road construction and timber harvesting in roadless areas eliminate the Wilderness values associated with them and therefore eliminate options for future Wilderness considerations.

e. Range:

No commercial livestock grazing would be permitted in unroaded areas so there are no environmental consequences.

f. Wildlife Habitat:

In the long term, unroaded recreation areas would benefit those animal species requiring natural old growth habitats but would reduce available habitat for species associated with early-stage vegetation. Wildlife species associated with old growth forests and tree snags, such as the northern three toed woodpecker, pine marten, and goshawks, would benefit from the unroaded recreation areas.

Areas managed for primitive and semiprimitive recreation provide suitable habitat for wildlife species not adaptable to roaded or developed areas.

If the roadless areas are developed timber harvesting increases forage availability for deer and elk. It can also reduce hiding cover in the short term. This can be mitigated by leaving screens, slash piling, or restricting human activity.

Timber harvesting activities also reduce the natural habitat for cavity dependent species. As timber harvesting increases, wildlife populations associated with mature and old growth stands will decrease and wildlife populations associated with younger stands will increase.

g. Old Growth:

Unroaded recreation areas would provide a large amount of old growth. If the areas are developed, however, some of the old growth would be lost.

h. Research Natural Areas:

All areas not designated as unroaded recreation would be available for Research Natural Area status. In Research Natural Areas, timber would not be managed for commercial purposes. Roads would not be constructed within the area and management would emphasize preservation of the natural unique ecosystem. Recreation would also be discouraged.

i. Scenic Quality

The impacts on roadless areas will relate directly to the number of those areas that are retained in roadless classification or released for some other management activity. Managing some of the roadless areas to meet the visual quality objectives will result in them being roaded and therefore reducing or eliminating the wilderness values associated with them.

If the roadless areas are developed timber management activities will change the visual appearance of the areas during both the short and long terms. Forest visitors will experience a change in forest structure from the existing condition of natural stands with larger trees and mixed ages to a more uniform managed forest with smaller trees and less dead material.

Through the application of the appropriate prescriptions and their associated standards and guidelines, vegetative management in sensitive visual areas can have the long-term effect of enhanced visual quality.

j. Geothermal Resources

Some Roadless Aeas have geothermal potential. If developed the exploration and development of the geothermal resource could also affect roadless areas. The extent to which geothermal and other resource management activities could potentially affect roadless areas can be determined by viewing Table C-1. These references show the acreages involved with different management strategies. Strategies which favor timber production and winter recreation/geothermal are generally compatible with geothermal exploration and development, so could affect the roadless character by creating roads. During the exploration phase some road construction may be required and, although the density of these roads would not likely be high, they would be higher than what currently exists. In current roadless areas, it may be possible to use low density roads developed for winter recreation for exploration or the reciprocal, using the roads developed for exploration for winter recreation purposes. If a resource were discovered and developed, road density would increase. Roadless areas could also be affected indirectly by noise, odors, and visuals from activities on adjacent areas.

Human activity associated with exploration and development may affect wildlife habitat use patterns on an intermittent basis. Exploration activities are generally low density and short term, ranging from a few days to a few months. If development takes place, activity would be substantially increased during construction and development, but would ultimately reduce to a lower level during production. The production phase would last for 30 or more years.

The timing and location of the activities in relation to key habitat and use patterns would determine the significance of displacement or disturbance. Potential conflicts would be greatest in areas where wildlife concentrate and during periods such as migration and reproduction.

Stipulations that restrict the season of use will be used to mitigate the effects and protect sensitive wildlife habitat.

Threatened and Endangered species habitats will be protected by limiting surface occupancy.

The old growth resource should not be significantly affected by geothermal exploration and development. This is because the acreage affected by activities will be small and dispersed.

k. Social and Economic:

In roadless areas, spiritual and therapeutic values would improve for those who seek solitude, remoteness, escape, and peace and quiet. Vicarious enjoyment would be greater for those who find security in the knowledge such areas exist.

Options for future generations to manage areas as wilderness would remain open if the areas are kept roadless, but would be reduced if the areas are modified or developed. Areas that currently have a high degree of solitude, remoteness, opportunities for primitive experience, challenge, unconfined recreation, uniqueness, and natural integrity would have these qualities diminished if they are developed.

As recreation use increases in the unroaded areas the number of person-caused fires would also increase. The potential damage is greatest in the unroaded areas because of larger accumulations of natural fuels and difficulty in fighting fires.

Contrasts between these developed roadless areas and other timbered lands will diminish if they are developed.

Primitive and unconfined recreation opportunities will be lost due to management activities and human intrusions in areas that are developed. Opportunities for other types of recreation, however, would increase. Economic activities in tourist oriented sectors and those providing camping, hiking, and other personal outdoor equipment will decrease when areas are developed. Economic benefits associated with the management, harvesting, manufacture, and retail sale in timber products from certain roadless areas will increase.

Recreation and its related service sectors are becoming an increasingly important component of the Central Oregon economy and way of life to the extent that an alternative accommodates the increasing demands for a diverse spectrum of recreation opportunities. This aspect of the Central Oregon lifestyles will remain stable and growing. Over the long term, the service sectors of the economy which facilitate and accommodate forest based recreationists will comprise a larger share of the local economic, jobs, income and tax base.

Potential damage to cultural resources will be directly related to the amount of soil disturbing activities.

Visual quality will be maintained at a high level in areas that remain unroaded and it will be reduced as areas are developed.

# APPENDIX D

# APPENDIX D

# STANDARDS AND GUIDELINES FOR ALL ALTERNATIVES

## I. INTRODUCTION AND PURPOSE

Standards and Guidelines were developed to meet resource objectives and to provide for the protection of resources. Standards and Guidelines were developed concurrently with management strategies and prescriptions. The standards, guidelines, and prescriptions were prepared before the Alternatives were developed. The intent was that the Standards and Guidelines would apply to all Alternatives, particularly those that were designed for resource protection. To avoid duplication and to streamline the Draft EIS, the Standards and Guidelines were only included in the Proposed Forest Plan which is an extension of Alternative E, the Preferred Alternative. These Standards and Guidelines, for the most part, apply equally to all Alternatives. They are found in the Proposed Forest Plan.

## II. SOURCE

The Standards and Guidelines were developed by the Interdisciplinary Team (ID) working as a team and not as individual specialists. The ID team used the Forest Service Manual, various handbooks, and research publications as sources of information. See the References section in the Draft EIS.

## III. VARIATION OF STANDARDS AND GUIDELINES BETWEEN ALTERNATIVES

Even though the Standards and Guidelines do not vary between Alternatives, the significance of them does. The Standards and Guidelines for soil and water become more significant in Alternatives C and E than in Alternatives F and G. The reason is there are more ground disturbing activities and vegetative manipulation in the first two Alternatives. The same concept holds true for Standards and Guidelines for cultural resources. The point is they apply equally to all Alternatives, but the significance may vary.

# APPENDIX E

# APPENDIX E

## Wild and Scenic Rivers

## A. General Setting

### 1. Introduction

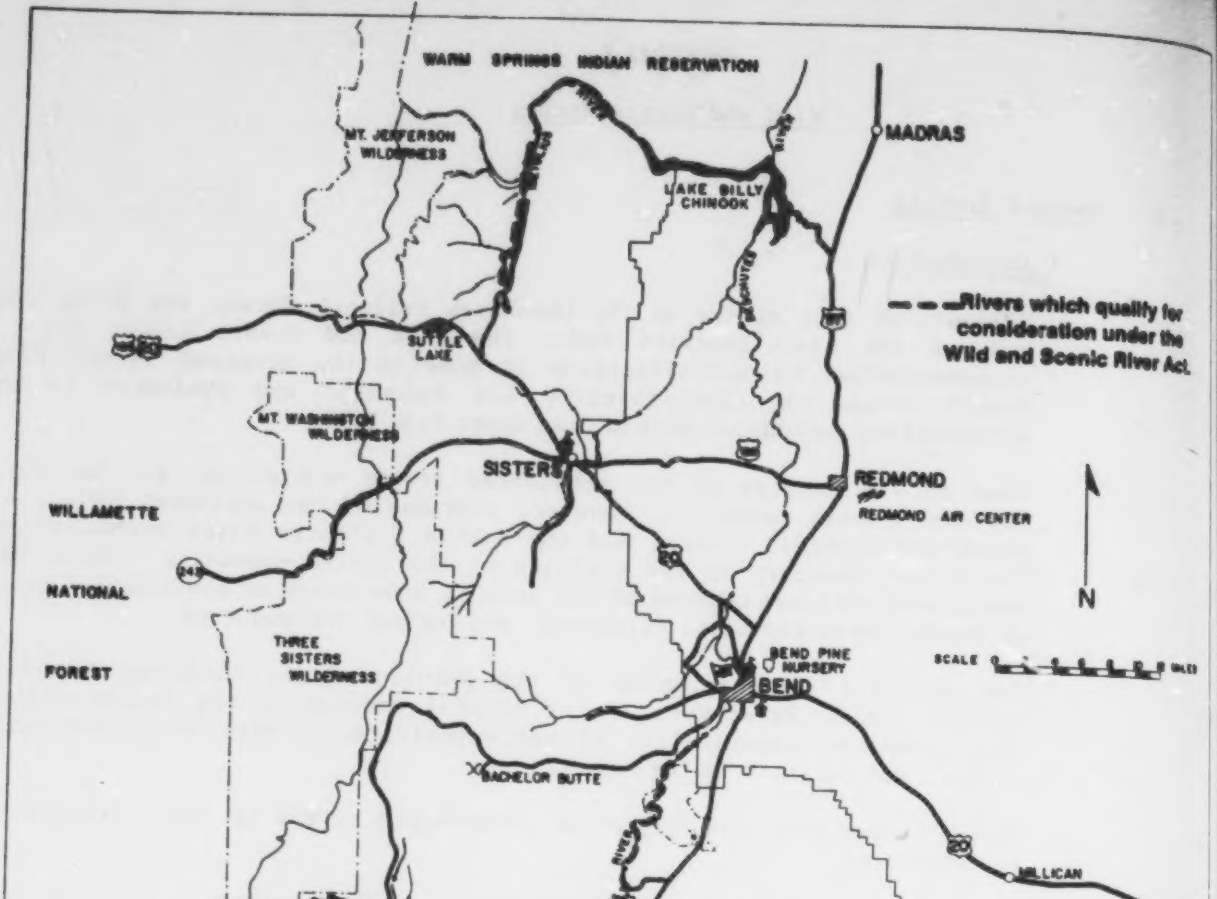
Segments of four rivers on the Deschutes National Forest are being considered for classification under the Wild and Scenic Rivers Act. A recommendation for classification is made in the proposed Forest Plan. Possibilities for classification are described and evaluated in the alternatives considered within the Forest Plan DEIS.

Most of the courses of the considered rivers are within the Deschutes National Forest boundary. However, portions of the Deschutes River, Big Marsh and Crescent Creeks, and the Little Deschutes River occur outside the Forest boundary in the vicinity of the LaPine community. These segments were included because of the need to have unbroken contiguous lengths of these rivers for best, effective, and logical designations.

Any proposed classification of the Metolius River bordering the Warm Springs Indian Reservation is of special concern to the Indian Tribes. They question compatibility of any classification with their ownership, rights, and interest in the river.

Table 1 describes the lengths of inventoried rivers by land jurisdiction and ownership.

Table 2 illustrates the estimated acreages of ownership in a ¼ mile zone on each side of the inventoried rivers.



DESCHUTES NATIONAL FOREST

U.S. DEPARTMENT OF AGRICULTURE – FOREST SERVICE

Figure XXIII

TABLE: 1

LENGTHS OF INVENTORIED RIVERS BY LAND JURISDICTION AND OWNERSHIP

LENGTH IN MILES

| River Name | Total | National Forest | BLM | State | Private (Other) | Common Boundary N.F. & Private | Common Boundary W/Pvt. | Common Boundary Warm Springs Indian Res. | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | W/N.F. | W/Pvt. |
| Big Marsh and Crescent Creeks | 41 | 20.1 | 1.2 | - | 19.7 | - | - | - | - |
| Little Deschutes | 97 | 17.5 | 1.9 | - | 77.6 | - | - | - | - |
| Deschutes | 53 | 30.2 | - | 3.6 | 10.4 | 7.1 | 1.7 | - | - |
| Metolius | 29 | 9.3 | - | - | 2.3 | .3 | - | 14.8 | 2.3 |
| Total | 220 | 77.1 | 3.1 | 3.6 | 110.0 | 7.4 | 1.7 | 14.8 | 2.3 |

Miles of inventoried rivers that are outside the National Forest Boundary

| River Name | Total | National Forest | BLM | State | Private (Other) | Common Boundary N.F. & Private | Common Boundary W/Pvt. | Common Boundary Warm Springs Indian Res. W/N.F. | W/Pvt. |
|---|---|---|---|---|---|---|---|---|---|
| Big Marsh and Crescent Creeks | 1.6 | - | - | - | 1.6 | - | - | - | |
| Little Deschutes | 2.9 | - | 1.5 | - | 27.7 | - | - | - | - |
| Deschutes River | 5.6 | - | - | 3.5 | .4 | - | 1.7 | - | - |
| Total Outside NF Boundary | 36.4 | - | 1.5 | 3.5 | 29.7 | - | 1.7 | - | - |

TABLE: 2

ESTIMATED ACRES OF OWNERSHIP IN ¼ MILE CORRIDOR
EACH SIDE OF INVENTORIED RIVERS

| River | National Forest | BLM | State (LaPine State Park) | Warm Springs Indian Reservation | Private (Other) | Total |
|---|---|---|---|---|---|---|
| Deschutes | 8,486 | 330 | 961 | - | 3,557 | 13,334 |
| Metolius | 4,877 | - | - | 2,453 | 995 | 8,285 |
| Little Deschutes | 886 | 1,035 | - | - | 10,548 | 12,469 |
| Big Marsh and Crescent Creeks | 4,948 | 118 | - | - | 4,008 | 9,074 |
| Total | 19,197 | 1,483 | 961 | 2,453 | 19,068 | 43,162 |
| Area of Overlap At River Junctions: | | | | | | |
| 1. Crescent Creek into Little Deschutes | - | -18 | - | - | -135 | -153 |
| 2. Little Deschutes | - | - | - | - | -67 | -67 |
| Net Total | 19,197 | 1,465 | 961 | 2,453 | 18,866 | 42,942 |

## 2. General Location and Description

The following table describes the location of the inventoried rivers by latitude and longitude range and the nearest significant influenced communities.

TABLE: 3

LOCATION AND DESCRIPTION

| River | Between<br>Latitude | <br>Longitude | Nearest Communities |
|---|---|---|---|
| Deschutes | 43°40' - 44°5' | 121°20' - 121°45' | Bend, LaPine |
| Metolius | 44°25' - 44°45' | 121°25' - 121°40' | Sisters |
| Little Deschutes | 43°15' & 43°55' | 121°25' - 122°00' | Crescent<br>Gilchrist,<br>LaPine |
| Big Marsh and Crescent Creeks | 43°15' & 43°35' | 121°35' - 122°00' | Crescent<br>Gilchrist |

## 3. Reason for Consideration

These river segments are being considered because they were identified as possible candidates for classification in the Nationwide Rivers Inventory.

This inventory was performed in two phases:

a. Phase I was completed by HCRS (Heritage Conservation Recreation Service) and documented in the publication "Nationwide Rivers Inventory: A Report on Natural and Free-Flowing Rivers in the Northwestern United States", August 1980.

b. Phase II, an update of the Phase I Inventory, was completed by the National Park Service and entered in the publication "The Nationwide Rivers Inventory", January 1982.

The lengths of rivers being discussed in this document are not considered to be Nationally significant. The Deschutes River below and beyond the segment considered here is probably of National fame for fishing and, to a lesser degree, scenery and white-water sports.

Both the Metolius and Deschutes Rivers are regionally known and popular for various water sports and their scenic environment. The Deschutes is also important for providing irrigation water. As previously mentioned, the Metolius River is of special importance and value to the Indian Tribes of the Warm Springs Reservation.

Big Marsh and Crescent Creeks and Little Deschutes Rivers are important as sources of irrigation water in the Central Oregon area. They are locally used for recreation, primarily fishing, but their relative significance and reputation for recreation use and scenery appears to be much less than that of the Deschutes and Metolius Rivers.

## B. Eligibility Determination

Table 4 illustrates categories used to determine eligibility and the resulting rating by river or creek.

TABLE: 4

MINIMUM ELIGIBILITY CLASSIFICATION

|  | Upper Metolius 1/ | Lower Metolius 2/ | Deschutes | Little Deschutes | Crescent and Big Marsh Creeks |
|---|---|---|---|---|---|
| Water Resources Development | Free of Impoundment.<br>S | Free of Impoundment.<br>W | Dam at Wickiup Reservoir at beginning of inventoried section. Waterflow regulated.<br>Major irrigation diversions.<br>R | Minor irrigation diversions.<br>S | Minor irrigation diversions.<br>S |
| Shoreline Development | Substantial evidence of human activity.<br>R | Essentially primitive.<br>W | Concentrations of houses all along river.<br>R | Some development.<br>Presence of extensive residential development.<br>R | Largely primitive.<br>Evidence of timber harvest and grazing.<br>Some scattered dwellings on lower half.<br>S |
| Accessibility | Readily accessible by road.<br>R | Generally inaccessible.<br>One existing very low standard road within river area.<br>S | Readily accessible by road.<br>R | Accessible in places by road<br>S | Accessible in places by road.<br>S |
| Water Quality | Exceeds Federal criteria.<br>Very cold.<br>W | Exceeds Federal criteria.<br>Very cold.<br>W | Meets Federal criteria.<br>Sedimentation due to reservoir regulation.<br>W | Meets Federal criteria.<br>High quality.<br>W | Meets Federal criteria.<br>Temperature fluctuation.<br>W |
| Eligibility | R | S | R | R | S |

W = Wild
S = Scenic
R = Recreation

1/ From source to Jefferson Creek
2/ From Jefferson Creek to mouth

## C. Description of General Resource

### 1. Upper Metolius River

The first 10 miles of the Metolius River are characterized by slow flowing water through aesthetically planned and developed recreation areas which include campgrounds, recreation residences, and open space. The vegetation varies from well-kept lawns to old-growth ponderosa pine/bitterbrush open space.

The Metolius River travels along the base of a fault known as Green Ridge. This steep-sided basin creates a variety of geologic features ranging from green valley floors to vertical-walled volcanic canyons and igneous intrusions.

The upper Metolius is readily accessible from National Forest roads. Many of the roads are open year-round. Eight bridges cross the river within this section making access from east to west quite easy. User trails parallel both east and west banks of the river except where it passes through private property.

The upper Metolius flows through the community of Camp Sherman. The nearest city is Sisters which is approximately 15 miles to the southeast. The river attracts visitors from the Willamette Valley as well as from out of state.

The river is famous for fly fishing. Eleven Forest Service campgrounds, 108 Forest Service recreation residences, and many private developments attact well over 122,000 recreation visitor days per year. Types of use include:

Viewing Scenery
Auto Touring
Motorcycle Travel
Canoeing
Fishing
Picnicking
Snow Play
Hunting
Gathering

Hiking
Bicycling
Horseback Riding
Water Play
Camping
Cabin Use
Cross-Country Skiing
Nature Study
Wildlife Viewing

The allocation in the presently approved Land Management Plan is Visual Retention-Foreground. In the proposed plan, the allocation will be redefined as Intensive Recreation.

Present uses on private land include single residences, farming, resorts, restaurants, Metolius Meadows subdivision, and many community services. Potential uses would be further subdivision and more homesites. Currently, Jefferson County zoning limits further development a great deal.

## 2. Lower Metolius River

The lower 19 miles of the Metolius River are entirely different from the upper portion. They are characterized by rapidly moving water flowing through natural stands of ponderosa pine, Douglas-fir, incense cedar, and true firs. The bank vegetation is dense and undisturbed. Generally speaking, the vegetation is more typical of a moister, warmer climate than the upper portion.

The lower Metolius flows between steep ridges. From Jefferson Creek, it flows north between Green Ridge and Walker Ridge. It then turns southeast as it flows between Metolius Bench and the east side of Green Ridge. At Perry South Campground, the river opens up and becomes a branch of the Lake Billy Chinook Reservoir which is formed by a dam at the confluence of the Metolius, Deschutes, and Crooked Rivers. The slack water portion of the river is not included in this inventory.

One very low-standard road parallels the east bank of the lower Metolius except for a 2-mile stretch at the most northern point. No roads exist in this 2-mile stretch or anywhere on the west bank which is the Warm Springs Indian Reservation. No maintained trails exist along the lower Metolius. However, a few short user paths have been created. Paved road access is available up to the west end of the lower Metolius at Bridge 99 and a gravel road provides access to the east end at Monty Campground.

The lower Metolius is not associated with any population center. The west end attracts visitors from the Camp Sherman/upper Metolius areas while the east end attracts visitors from the Madras/Culver area. The lack of quality roads limits the recreation visits.

The lower Metolius attracts fishermen, rafters, dispersed campers, and hikers. There is one developed Forest Service campground which receives limited use. No accurate use figures have been collected for this section of the river.

Presently, the lower Metolius is in the Special Management allocation of the Land Management Plan. In the proposed plan, it will be designated as Undeveloped Recreation-Motorized.

Present uses on private land include single residences. The potential uses permitted in Jefferson County zoning are limited to one dwelling. However, it would be possible to establish gravel quarries, logging operations, or an organization camp.

## 3. Deschutes River

The Deschutes River runs through an extremely diverse and complex variety of geologic features. Recent and ancient lava flows, mud flows, pumice deposits, and glacial outwash plains are some of the features which provide people with an excellent opportunity to see and learn about the origin of this unique area.

The Deschutes River is composed of various lengths of smooth, quiet flowing water, fast flowing water, and rapids. There are intermittent stretches of falls and steep rapids, particularly between Benham Falls and the north end of this inventoried section.

There are several falls or rapids of significance including Pringle Falls, Benham Falls, and Dillon Falls. Benham Falls descends through a gorge along the south end of the Lava Butte lava flow. Several other falls, including Dillon Falls, occur where the river flows along this lava flow.

This segment of the river passes through a variety of vegetation, including various age classes, particularly old-growth ponderosa pine and lodgepole pine. Mixed conifer, including true fir and Douglas-fir, are encountered less commonly. Aspen occurs along the Lava Butte lava flow. Open meadows, willows, and other riparian vegetation occur along the entire length.

Generally, the upper Deschutes is easily accessible by road, primarily in the portions between Wickiup Dam to LaPine State Park, at General Patch Bridge at Harper Bridge, and the portion between Benham Falls and Bend. Eight public boat ramps are provided between Wickiup Dam and Dillon Falls. There are stretches of 1 or 2 miles of very limited road access. Access is limited between LaPine State Park through Sunriver by private land.

The Deschutes River is a primary attraction for all of central Oregon. It has influence on the economies of Bend, Redmond, and LaPine. The river is very popular and a focal point for a variety of recreation activities. Fishing for trout, waterfowl hunting, camping, picnicking, swimming, and wading take place at various locations. Some waterskiing and motorboating occur, primarily between Pringle Falls and Harper Bridge. Floating by canoe, boat, tube, etc., is very popular. The Deschutes River accounts for 106,000 recreation visitor days per year.

Currently, the visual management allocation is applied to the Deschutes River in the Land Management Plan. The proposed plan would change the allocation to Intensive Recreation.

The amount of water and flow of the river are controlled and managed to provide water for irrigation. The adjacent public lands are managed to provide recreation opportunities. Most of the mid-portion of the river, about 10 miles, is in private ownership and is developed or being developed for homesites adjacent to the river or managed to provide various roads of the Sunriver home and resort community. The potential for further subdivision is great.

### 4. Little Deschutes River

The Little Deschutes has a flat, meandering flow even in the upper reaches with pronounced oxbows below Crescent Creek. There are no rapids or falls but the flow is not sluggish.

The majority of the stream flows through strings of meadows and forest combinations. Below Mowich, agricultural land and scattered subdivisions become evident. Most of the shoreline is vegetated with grasses and sedges. Forest land is composed primarily of lodgepole pine with some ponderosa pine in limited areas.

The Little Deschutes is accessible by foot travel almost anywhere, but road access is limited. The most restricting factor is private land. There are bridges at Emigrant Crossing, Highway 58, Crescent, and Gilchrist.

The largest metropolitan area in the proximity of the Little Deschutes is Bend. The smaller communities of Crescent, Gilchrist, and LaPine are also influenced by the Little Deschutes.

The Little Deschutes attracts 18,000 recreation visitor days per year. Types of use include swimming, wading, tubing, picnicking, walking, fishing, and camping.

Presently, the Little Deschutes is in the visual management allocation of the Land Management Plan. The proposed plan designates the upper portion to the General Forest Management Area and a portion near Crescent to the Scenic Views Management Area.

From the source to Mowich, adjacent public land is managed primarily for timber production. There is some grazing. North of Mowich there is a combination of timber, agriculture, and rural subdivisons. At Gilchrist, the river goes through the Gilchrist Timber Company mill and pond area. Since the Little Deschutes flows primarily through private land (84 percent), the potential for homesite development is great.

5. Crescent and Big Marsh Creeks

Crescent Creek has a flat, meandering flow with pronounced oxbows. There are no rapids of any significance, but it is deep and the flow is strong. Flow is regulated by Crescent Lake dam.

Forest vegetation is largely lodgepole and ponderosa pine types with lodgepole predominant. There is extensive willow, alder, and other brush along the banks for long stretches.

Marsh lands surround the upper reaches of Big Marsh Creek. The lower end of Crescent Creek flows through areas of meadow grasses and sedge.

Access is difficult except for lower Crescent Creek because of heavy timber, brush, or marsh. There is very little direct road access. Private land limits access, especially on lower Crescent Creek.

The towns of Crescent and Gilchrist are the nearest population centers. Crescent Creek flows to within 3 miles west of town.

Dependence on the creeks for recreation use is limited. Due to windfall, little opportunity for floating or boating exists, except in the lower reaches of Crescent Creek. Fishing from the banks does occur.

Sections of Big Marsh and Crescent Creeks fall within the game species, visual management, and wood forage management options of the Land Management Plan. The proposed plan would classify most of Big Marsh Creek in General Forest. Crescent Creek is within Scenic Views where it passes Odell Butte and the remainder is in General Forest.

Most land use along Big Marsh Creek is timber and grazing. Crescent Creek receives more grazing. Very little homesite development has occurred along these creeks.

## D. Water Resource

### 1. Yield

Table 5 shows water yields by indicated stream lengths.

## TABLE 5

## WATER YIELDS

| | Drainage Area (Sq. Mi.) | Average Streamflow (CFS)[1] | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | Jun. | Jul. | Aug. | Sep. | Annual |
| Deschutes River: | | | | | | | | | | | | | | |
| - Below Wickiup Res. | 483 | 644 | 218 | 202 | 242 | 280 | 295 | 556 | 981 | 1278 | 1596 | 1465 | 1183 | 753 |
| - At Benham Falls | 1759 | 1210 | 901 | 914 | 939 | 1002 | 1059 | 1323 | 1733 | 1920 | 2058 | 1923 | 1640 | 1424 |
| - Below Bend | 1899 | 346 | 744 | 843 | 885 | 909 | 901 | 510 | 270 | 239 | 157 | 159 | 221 | 515 |
| Metolius River near Grandview | 316 | 1360 | 1407 | 1485 | 1527 | 1545 | 1524 | 1551 | 1617 | 1653 | 1532 | 1428 | 1375 | 1499 |
| Little Deschutes River near LaPine | 859 | 86 | 116 | 153 | 152 | 178 | 195 | 299 | 396 | 337 | 243 | 198 | 118 | 207 |
| Big Marsh Creek near Hoey Ranch | 51.5 | 26 | 44 | 64 | 49 | 53 | 72 | 140 | 177 | 121 | 50 | 27 | 22 | 70 |
| Crescent Creek below Crescent Lake | 60.7 | 24 | 15 | 15 | 17 | 20 | 25 | 27 | 59 | 108 | 167 | 153 | 70 | 58.8 |

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[1] Source: McCammon, B.P., "Streamflow Characteristics of the Deschutes National Forest for Records Through Water Year 1977", 1979, 84 p.

2. Uses

a. Reservoirs

TABLE: 6

EXISTING RESERVOIRS WHICH COULD AFFECT OR BE AFFECTED BY CLASSIFICATION AS WILD-SCENIC-RECREATION

| Name | Built | (Ac.Ft.) Capacity | Purpose |
|---|---|---|---|
| Crane Prairie | 1922 | 55,000 | Irrigation |
| Wickiup | 1942 | 200,000 | Irrigation |
| Crescent Lake | 1922 | 117,200 | Irrigation |
| Lake Billy Chinook | 1964 | 534,700 | Power (Round Butte) |
| Lake Simtustus | About 1958 | 4,100 | Power (Pelton) |

b. Withdrawals - Power and Irrigation

(1) Lower Metolius River - Refer to attached maps for exact locations.

(a) Power Site Reserved - PSR No. 66; 7/2/1910

1. T. 11 S., R. 9 E., sec. 1

2. T. 10 S., R. 10 E., secs. 28, 29, 31, 32, 33, 34

3. T. 11 S., R. 10 E., sec. 13

4. T. 11 S., R. 11 E., secs. 28 and 29

(b) FPC 2259 10/19/59 T. 11 S., R. 11 E., secs 19, 28, 29

(c) FPC 2092 10/11/51 T. 11 S., R. 11 E., secs. 28, 29

(d) FPC 57 9/14/20 T. 11 S., R. 11 E., secs. 28, 29 (License for FPC 57 was cancelled 12/19/36)

(2) Upper Metolius River - None

(3) Deschutes River - Refer to attached maps for exact locations.

(a) Irrigation withdrawals on both Crane Prairie and Wickiup Reservoirs.

(b) Power Withdrawals

1. Benham Falls - Power site reserved; PSR No. 68; 7/2/1910; T. 19 S., R. 11 E., sec. 9.

[1] Power withdrawal information taken from Deschutes National Forest Land Status Atlas."

2. Dillon Falls - Power site reserved; PSR No. 68; 7/2/1910; T. 19 S., R. 11 E., sec. 4.

3. Lava Island Falls - Power site reserved; PSR No. 68; T. 18 S., R. 11 E., sec. 27 and sec. 34.

(4) Little Deschutes River - Power site reserved; 7/14/33; T. 20 S., R 11 E., sec. 31 (80 acres); PSR No. 19.

(5) Big Marsh Creek - No power withdrawals; there is, however, a Bureau of Reclamation withdrawal for the purpose of creating an irrigation reservoir which would store 200,000 acre-feet. This reservoir would have a surface area of 3,800 acres and have a peak elevation of 4800 feet.

Crescent Creek - No withdrawals other than Crescent Lake Reservoir site.

c. Irrigation

Irrigation plays the most significant role in the many uses made of water in the Deschutes basin. A 1913 withdrawal by the State Engineer removed all water in the upper Deschutes basin (above Bend) from further appropriation in order to protect the established and potential irrigation flows.

Within the Deschutes River basin (including Crooked River), 5,452 cubic feet per second (cfs) are appropriated for the irrigation of 259,469 acres (State Water Resources Board, 1961).[1] Within the upper Deschutes River basin (above Benham Falls) 317 cfs are appropriated for irrigation of 13,835 acres. Irrigation water rights are held on Crescent Creek, Davis Lake, Deschutes River, Little Deschutes River, and Paulina Lake and Creek (SWRB, 1961).

In the middle Deschutes River basin, 3,505 cfs are appropriated for the irrigation of 135,636 acres. Major diversions of water occur on the Deschutes River near Lava Falls (Arnold Irrigation District), near Bend (Central Oregon Irrigation District), and at Bend (North Unit, Tumalo Irrigation Districts).

d. Water Rights

Water rights within the upper Deschutes Basin and middle Deschutes Basin are summarized in Tables 3 and 4 which were taken from the State Water Resources Board 1961 publication on the Deschutes Basin. Some additional water rights have been appropriated but, due to the 1913 irrigation withdrawal, have not changed the appropriation picture significantly.

e. Domestic Uses

Numerous small domestic diversions take place on Crescent and Big Marsh Creeks and the Deschutes River. These uses are summarized in Tables 7 and 8.

[1] State Water Resources Board, 1961. "Deschutes River Basin", 188 p.

Municipal diversions within the Deschutes Basin occur on Tumalo Creek and Squaw Creek. No municipal diversions occur on any of the sections proposed for classification.

TABLE: 7

SURFACE WATER RIGHTS SUMMARY
SUB-BASIN 1 - UPPER DESCHUTES RIVER
(ABOVE BENHAM FALLS)

| Use | Stream | Cfs |
|---|---|---|
| Domestic | Crescent Creek | 0.3 |
| | Deschutes River | 0.1 |
| | Little Deschutes River | 0.4 |
| Irrigation | Crescent Creek | 22.9 |
| | Deschutes River | 243.6 |
| | Little Deschutes River | 37.0 |
| Industrial | Little Deschutes River | 2.0 |

TABLE: 8

SURFACE WATER RIGHTS SUMMARY
SUB-BASIN 2 - MIDDLE DESCHUTES RIVER
(BENHAM FALLS - MECCA)

| Use | Stream | Cfs |
|---|---|---|
| Domestic | Deschutes River | 3.9 |
| | Metolius River | 0.8 |
| Irrigation | Deschutes River | 3,001.3 |
| | Metolius River | 7.5 |
| Municipal | Deschutes River | 23.1 |
| Industrial | Deschutes River | 201.3 |
| Recreation | Metolius River | 0.1 |
| Power | Deschutes River | 1,582.8 |
| Fish | Metolius River | 45.0 |

### f. Flood Control

There are no flood control structures or the need for any on the stream sections proposed for classification. Wickiup, Crane Prairie, and Crescent Lake Dams could serve to mitigate flood flows, but are not operated in a manner which is conducive to peak flow abatement.

## 3. Hydroelectric Potential

Table 9 illustrates hydroelectric power potential and Table 10 shows possible low-head hydroelectric sites.

TABLE: 9

HYDROELECTRIC POWER POTENTIAL[1]

| Name | Stream | River Mile | Capacity (MW) |
|---|---|---|---|
| Metolius Bench | Metolius | 12 | 42 |
| Lava Island Falls | Deschutes | 174 | 20 |
| Dillon Falls | Deschutes | 177 | 24 |
| Benham Falls | Deschutes | 183 | 62 |

TABLE: 10

POTENTIAL LOW-HEAD HYDROELECTRIC SITES[1]

| Name | Stream | Capacity (MW) |
|---|---|---|
| Benham Falls | Deschutes | 4.6 |
| Lava Island | Deschutes | 4.6 |
| Dillon Falls-Low | Deschutes | 4.5 |
| Dillon Falls-High | Deschutes | 4.6 |
| Wickiup Dam | Deschutes | 2.7 |
| Bend Power Dam | Deschutes | 1.2 |
| Metolius Bench | Metolius River | 11.1 |
| Crescent Creek | Crescent Creek | 1.7 |
| Jefferson Creek | Metolius River | 7.6 |
| Jack Creek | Metolius River | 5.8 |

[1] Water and Power Resources Service, 1980. "Western States Inventory of Low-Head Hydroelectric Site Report."

Applications for use of diverted water to generate power have been filed on every major irrigation canal taking water from the Deschutes River. Currently, preliminary permits have been issued by the Federal Energy Regulatory Commission to the following groups:

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[1] U.S.C.E., 1976. "Summary of Northwest Hydroelectric Power Potential", 24 p.

North Unit Irrigation (No. 3560)
General Energy Dev. (No. 5205)
Arnold Irrigation Dist. (No. 4071)
Tumalo Irrigation Dist. (No. 6473)
Wild River Owners Assoc. (No. 6573)

4. Water Quality

Water Quality on all the streams proposed for classification may be considered as excellent based on criteria for aesthetics. In fact, these streams are some of the most visually pleasing of any streams on the Deschutes National Forest.

Floating debris, oil, scum, and other matter are not obvious problems on any of the streams.

Color, odor, taste, turbidity - All the streams have low color values and may be considered nearly transparent. Sediment in the main Deschutes River does reduce the clarity of the water during irrigation season and provides a brownish color to the water. All of the streams must be considered as having low turbidities, however.

Radionuclides and toxins - There has been no mention or report of significant (i.e., measurable) amounts of these variables in any of the stream segments. Very low concentrations of 2,4-D and other organic chemicals have been detected, but not in concentrations which affect aquatic organisms or primary contact recreation.

Undesirable acquatic life - The only concentration of algae or aquatic plants which is affecting the aesthetic quality of the streams proposed for classification is in Mirror Pond in the city of Bend.[1] Due to rapid sedimentation and "high" nutrient loads (duck guano), filamentous algae are choking this scenic pond.

## Fish and Wildlife

1. Upper Metolius River

Populations of rainbow, Dolly Varden, brook and brown trout as well as kokanee and white fish can be found. Stocking of catchable rainbow trout is done by the State. Most of the Upper Metolius is restricted to fly fishing and is nationally renowned for this activity.

Mule deer are very numerous and the area is an important winter range. Beaver, otter, and ground squirrels are active.

2. Lower Metolius River

The fish species are the same as the upper portion, but no stocking occurs. The "fly fishing only" restriction is lifted beyond Bridge 99.

Mule deer, elk, and wild turkey frequent the area. Black bear, bobcat, coyote, badger, and marmots are found. Numerous species of birds nest or pass through the area, the most important being the bald eagle.

3. Deschutes River

A diversity of habitat exists along the river, providing homes for a variety of wildlife. Lush secluded meadows surrounded by geologic oddities have become sanctuaries along the river for many animals. Rocky bluffs and thick patches of brush offer excellent quarters, hiding spots, and hunting grounds for a myriad of wildlife. Fishing is a major attraction to the area. In the past, the Deschutes River was probably one of the finest angling rivers in Oregon before the river was dammed. Big game such as elk and deer inhabit the area throughout the year. There have been 130 different species of birds identified in the area. In addition to songbirds, numerous raptorial birds frequent the area. Osprey are a common sight up and down the river, while an adult bald eagle and peregrin falcon have been seen near Benham Falls and in the Wickiup area. Golden eagles and hawks, such as the red-tail, goshawk, and marsh hawk, frequent the area with the latter two probably stopping over during their migration.

Fishing for brown and rainbow trout and whitefish is still popular. The fishery is natural and stocked, primarily with rainbow trout. The river is considered a "blue ribbon" fishery for brown and good for rainbow trout.

Two bald eagle nests and numerous osprey nesting sites occur along the river. These birds are dependent on the river for foraging. An important deer migration route crosses the river between the Sunriver area and Benham Falls.

4. Little Deschutes River

The only endangered species is the bald eagle which nests on the upper portion of the river. Other wildlife would be those species typical to the vicinity.

The fishery is cold water with some stocking. There is no anadromous fishery. The river supports fishing and is of moderate to good quality. Primary species are rainbow and brown trout.

5. Big Marsh and Crescent Creeks

The fishery is cold water with some stocking in the past. The only significant species is rainbow trout. Quality is moderate.

Besides the usual wildlife species common to the area, an elk population is developing on upper Big Marsh Creek. Bald eagles can also be found on the upper reaches of Marsh Creek.

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[1] (Beyond the segments being considered in this evaluation.)

## F. Recreation

### 1. Upper Metolius River

The upper Metolius is considered to be one of the best fly fishing rivers in Oregon. It is also one of the more heavily visited scenic areas on the Deschutes National Forest. The Headwaters of the Metolius received 53,300 visits during 1982. The Metolius is one of the largest spring driven streams in the United States. The upper Metolius is dedicated to developed recreation activities.

Recreation expectations include some opportunities for solitude, but are mostly directed toward a developed, modern, high social interaction recreation experience. Paved roads, developed campgrounds, private resorts, restaurants, 122,000 visitor days per year, and recreation residences along the river bank all contribute to this recreation experience.

Low risk floating and tubing is a popular activity even though the water is very cold. This temperature (45°F) does inhibit swimming, however. Hiking and camping opportunities are extensive. Approximately 50 percent of the river bank is left in undeveloped open space and 50 percent is developed recreation.

Driving for pleasure, sightseeing, photography, wildlife, and nature study are all very popular. The Metolius River is located at the base of several snow-capped mountain peaks of the Cascade Range. The scenery is exceptional. This scenery along with paved roads also provides the opportunity for bicycling and horseback riding.

Recreation demand will probably remain close to the current use levels. We are probably close to maximum use now.

### 2. Lower Metolius River

The lower Metolius attracts dispersed recreation activities. The opportunity setting is semiprimitive with difficult access, no logging activities evident, only one developed facility, and very little social interaction.

Fishing is the primary activity along with the dispersed camping and sightseeing. The river is very fast flowing at the bottom of a canyon which is very scenic.

High risk floating on white water is an increasing activity. The river is the boundary between the National Forest and the Warm Springs Indian Reservation. The reservation does not want to invite additional rafting use.

The environment is unique throughout this section of river. The east side of the river has very dense mixed conifer old-growth vegetation while the west side is very dry, sparsely stocked ponderosa pine old growth with very little understory vegetation. The contrast is striking. The west bank rises steeply to a sheer, vertical cliff of rimrock. The overall effect is an undeveloped, unspoiled forest environment.

Future recreation demand is expected to increase yearly. Popularity of dispersed recreation is increasing and the lower Metolius serves as an overflow area for other sections of the river.

3. Deschutes River

The Deschutes River is very popular. Visitors fish for trout along its entire length. Camping occurs along the river within the Experimental Forest at LaPine State Park and to a lesser degree at a few locations north of Sunriver. Waterfowl hunting occurs along portions of the river. Picnicking, wading, and swimming take place at various locations. White water rafting is a growing activity. However, a few of the rapids are not negotiable and fatalities have occurred.

In general, the recreation opportunity setting is Semimodern with moderately difficult access, evidence of some logging and other non-recreational uses, areas of developed recreation facilities, and moderate social interaction.

Portions of the river pass through stands of large, old-growth ponderosa pine, particularly in the Pringle Falls Experimental Forest. This creates some excellent scenic views. There are intermittent sections that pass through vegetation and geologic features of significant scenic quality. Benham Falls, Dillon Falls, Pringle Falls are notable examples.

Future recreation demand is expected to increase. Its proximity to Bend makes the Deschutes very available.

4. Little Deschutes River

There is little opportunity for floating or boating activities south of the Crescent vicinity. There is no real white water. There is swimming, wading, and tubing north of the Crescent vicinity. Therefore, opportunities for picnicking and short walks through strings of meadows occur.

There is some motorboating, but it is confined mostly to low speeds for fishing. The best opportunities for camping are at established campgrounds such as Little Deschutes and Rosland (USFS) and Bingham (County).

There are no outstanding recreation values but there are stretches of the stream that pass through visually pleasing meadows and forest combinations. In the LaPine vicinity, houses and building are visible down to the edges of the meadowland through which the river flows. While these are not degrading to the river or meadows, they are visible.

Future recreation demand is expected to increase somewhat, primarily due to an increase in population in the immediate vicinity.

5. Big Marsh and Crescent Creeks

There is little opportunity for any floating or boating activity due to windfall. The lower reaches of Crescent Creek provide some opportunity. Fishing from the banks is the most popular activity.

There are no significant scenic values.

Future recreation demand is not expected to increase markedly.

## G. Minerals, Energy

None of the rivers being inventoried are located in areas of geologic formation which would indicate locatable minerals.

Currently, there are several applications on file to develop hydroelectric facilities on the Deschutes River. This was described in Section D, Water Resource.

Geothermal lease applications were filed for lands adjacent to the Metolius River, but these applications have been withdrawn. Applications were filed that would encompass 3 miles of the Deschutes River and 1 mile of Crescent Creek. These applications are still pending.

## H. Timber

Table 11 illustrates the estimated timber in a ¼-mile zone on each side of the inventoried river.

TABLE: 11

TIMBER VOLUME

| | | Timber Types | Total Standing Volume Estimate | 3 (Ft./Yr.) (Site Index) Potential Yield | Programmed Harvest | Insect and Disease |
|---|---|---|---|---|---|---|
| Upper Metolius River | P1<br>P6<br>MM | Ponderoasa Pine<br>Lodgepole<br>Western Larch | 66 MMBF | 39-42 | 85% of Wood/Forage Allocation | Has been salvage logged.<br>Has some mistletoe in pine.<br>Potential is low.<br>Larch casebearer in larch. |
| Lower Metolius River | P9 | Ponderosa Pine<br>Douglas-Fir<br>White Fir<br>Incense Cedar<br>Western Larch | 73 MMBF | 80<br>106 | None | More mistletoe in Douglas-fir overstory infecting reprod.<br>Potential somewhat higher than upper Metolius. |
| Deschutes River | | Ponderosa Pine<br>Lodgepole<br>Mixed Conifer | 47 MMBF | 78<br>50 | 85% of Wood/Forage Allocation | Mountain pine beetle in lodgepole. |
| Little Deschutes River | | Lodgepole<br>Engleman Spruce<br>W. Hemlock<br>Shasta Red Fir<br>White Fir | 4 MMBF (Bend)<br>6 MMBF (F.R.)<br>15 MMBF (Cres.) | 51-85<br>82 | 85% of Wood/Forage Allocation | Mountain pine beetle catastrophic in lodgepole. |
| Big Marsh and Crescent Creeks | | Lodgepole<br>Eng. Spruce | 13 MMBF | 51-85 | Intensively managed as Wood/Forage and 85% of Wood/Forage | Mountain pine beetle catastrophic in lodgepole. |

## I. Historical-Cultural

### 1. Metolius River

The Metolius Basin has been used by Native American peoples for hunting, fishing, and plant food gathering for millenia. The springs were first discovered by white men in 1865 and the area was rapidly settled soon thereafter. The basin attracted summer home seekers from Sherman County by 1910. Many of the original summer homes are still occupied and used by descendents for their original purpose. During the 1930's, the Civilian Conservation Corps constructed several recreation facilities along the Metolius. No cultural sites are presently on the National Register.

The Metolius River has not been fully surveyed, but some sites have been located.

### 2. Deschutes River

Prehistoric sites are known to exist all along the Deschutes River. Most sites consist of lithic scatters found on benches and flats along the river. Some lithic scatters have also been found along drainages away from the river. The largest site apparently was east of the River and has been severely impacted by Camp Abbot and the Sunriver development. Indications are that the Lava Falls rock shelter may be 8,000 to 10,000 years old and may be the oldest known site in the area.

Historic use of the area began with the fur trapping activity in the early 1800's. The river area provided a route of travel for fur trappers, military expeditions, pioneer wagon trains, railroads, and logging activity. The remains of logging camps and Camp Abbot manuevers are the most recent evidence of historical activity.

Many of the historic and prehistoric sites are very subtle and difficult to locate.

Along the river, intensive logging has occurred since the early 1900's to present. These activities have left plentiful historic evidence including railroad grades, campsites and settlements, trestles, and dumps.

The Deschutes River has been fully surveyed but many sites have been located.

### 3. Little Deschutes River

There is little evidence of intensive prehistoric Indian activity along the entire length of the river. The little evidence available usually represents hunting, fishing, and campsite activity. The Little Deschutes River has been surveyed with few sites found.

### 4. Big Marsh and Crescent Creeks

Big Marsh Creek has not been subject to intensive archaeological survey. A few large prehistoric encampments have been found suggesting that the meadow was used for hunting, fowling, and gathering.

J. Transportation

The existing transportation routes which affect the four inventoried rivers will probably not change significantly in the foreseeable future. Statewide and local access is developed to a high level.

At one time, a two-lane paved road was planned that would have paralleled the entire length of the Metolius River. The right-of-way was cleared but the project was stopped before it proceeded further. If the road had been completed, it would have entirely changed the character of the lower Metolius. There are no plans of ever completing this road.

Presently, access to the Deschutes River is by a maze of low standard roads with more roads generated every year by recreationists, ORV use, and other activities. These roads result in high resource impacts, for example, erosion and wildlife harassment are impractical to manage.

A transportation plan has been developed that provides direction to manage access to the river.

K. Grazing

Grazing does not have a significant effect on any of the inventoried rivers.

# WILDLIFE HABITAT ATTACHMENT

## Big Marsh Creek

Mountain whitefish may be the only species resident to the entire length of the creek. Rainbows and brown trout are residents from the mouth upstream to about Big Marsh. Brook trout occur from about Big Marsh upstream to headwaters. Very cold water (low 50's°F in August) slows fish growth.

### CY 1977 Fish Production Estimates from Oregon Department of Fish and Wildlife:

- -Average of 88 resident trout (species distinction not made) harvested per river mile, annually.
- -Average of 71 fishing recreation days (ODFW definition not coinciding with USFS definition) per river mile, annually.
- -Average of about 1.2 (88÷71) resident trout harvested/fishing recreation day/river mile, annually.
- -Population of resident trout is maintained by 100 percent natural reproduction.

### CY 1966 Fish Habitat Survey From Oregon Department of Fish and Wildlife:

### Stream Reach from Mouth to Big Marsh

A scarcity of available pools result in a pool-riffle ratio of 1:47 (optimum resident trout habitat has approximately equal amounts of pool and riffle, or 1:1). Average width for this reach is 15 feet. Good spawning gravel is relatively sparse (average of 15 feet. Good spawning gravel is relatively sparse (average of 75 square yards/river mile, or 8/10 of 1 percent of the channel in good spawning gravel).

### Stream Reach from Big Marsh Upstream to Headwaters

No survey data available. Field observations are that the spawning conditions are relatively similar to downstream, with little or no good gravel. Pools are not abundant and neither are riffles; a good portion of this reach is in "runs" (slow-moving, unbroken water of uniform depth).

### T&E Species

An occasional bald eagle may hunt waterfowl within Big Marsh itself, but is not dependent upon this water. No other T&E species (animal or plant) are known from the habitats of this creek.

### Riparian Habitat

Riparian vegetation, predominantly grasses and sedges, occur along Big Marsh Creek. Willow and birch are scattered throughout the length. Big Marsh, itself, has two major plant communities. The sedge/rush marsh with standing surface water all or most of the growing season, and the tufted hairgrass moist meadow. The marsh is breeding grounds for numerous Wilsen's phalaropes, a few pair of sandhill crane, and other assorted water birds. The marsh and upstream reaches are summer range for an increasing Roosevelt elk herd that may number as many as 200 animals.

## Crescent Creek

Rainbow and brown trout, in addition to mountain whitefish, are residents throughout the length of Crescent Creek. Moderate water temperatures result in relatively good fish growth.

CY 1977 Fish Production Estimates from Oregon Department of Fish and Wildlife:

-Average of 53 resident trout (species distinction not made) harvested per river mile, annually.

-Average of 43 fishing recreation days (ODFW definition not coinciding with USFS definition) per river mile, annually.

-Average of about 1.2 (53÷43) resident trout harvested/fishing recreation day/river mile, annually.

-Population of resident trout is maintained by 100 percent natural reproduction.

CY 1966 Fish Habitat Survey from Oregon Department of Fish and Wildlife:

Average stream width is 30 feet. Pool scarcity results in a poor pool-riffle ratio of 1:46 (optimum resident trout habitat is about 1:1). Good spawning gravel is relatively sparse (average of 70 square yards/river mile, or 4/10 of 1 percent of the channel in good spawning gravel).

### T&E Species

No T&E species are known to use or reside in the habitats of this creek reach.

### Riparian

Willow and grass/sedge vegetation dominate the riparian zone of this stream providing streamside habitat for riparian nongame birds and other wildlife.

## Deschutes River (Wickiup Dam Downstream)

Rainbow and brown trout, in addition to mountain whitefish, are residents in the river segment from Wickiup Dam downstream to Forest boundary. Brown bullheads are present in the lower portion of this segment, but their presence much above Pringle Falls is doubtful.

### CY 1977 Fish Production Estimates from Oregon Department of Fish and Wildlife:

-Average of 226 resident trout (species distinction not made) harvested per river mile, annually.

-Average of 210 fishing recreation days (ODFW definition not coinciding with USFS definition) per river mile, annually.

-Average of about 1.1 (226÷210) resident trout harvested/fishing recreation day/river mile, annually.

-Population of resident trout is maintained from 60 percent natural or wild fish and 40 percent hatchery-reared and released fish.

### Fish Habitat Information

No survey data available for this segment (Wickiup to Forest boundary). Field observations are that spawning habitat is very limited (historic gravel beds have "cemented" in with sediment resulting from bank erosion caused by fluctuating water levels. The river in this segment is essentially one long "run" (slow-moving, unbroken water of uniform depth), with minimal riffles.

### T&E Species

Bald eagles hunt the river for both fish and waterfowl all yearlong. Two bald eagle nest sites are located along the river; one near Bate's Butte and the other near Dilman Meadow. No other T&E species are known to occur along the river in this segment.

### Riparian Habitat

The riparian zone along the river is quite variable in width from none to sloughs and meadows of several acres. Willows, where present, are often luxurient, providing a deciduous canopy for dependent species such as the yellow warbler, Wilson's warbler, and yellowthroat. River otter, beaver, and muskrat also are present.

## Little Deschutes River

Brook trout are resident from headwaters downstream to just north of Cow Camp. Brown trout are resident from about Cow Camp downstream to Deschutes River confluence. Rainbow trout are resident in lower reaches, mostly off Deschutes National Forest. Mountain whitefish are resident throughout; exact distribution limits unknown.

### CY 1977 Fish Production Estimates from Oregon Department of Fish and Wildlife:

- -Average of 125 resident trout (distinction between brook or brown not made) harvested per river mile annually for segment including Deschutes National Forest lands.

- -Average of 61 fishing recreation days (ODFW definition not coinciding with USFS definition) per river mile annually for same reach.

- -Average of about 2.0 (125÷61) resident trout harvested/fishing recreation day/river mile, annually. Lower reaches off Deschutes National Forest averaged about half this, because brown trout make up bulk of catch and they are much harder to catch than brook trout.

### CY 1965 Fish and Habitat Survey from Oregon Department of Fish and Wildlife:

- -Spawning habitat poor upstream from Emigrant Crossing (lack of suitable gravel). Essentially, the only good spawning gravel between the Little Deschutes Campground and the headwaters occurs from approximately Emigrant Crossing downstream. In this 2½-mile stretch, there is an average of 274 square yards/river mile (or 3.3 percent of the channel) in the good spawning gravel.

- -Rearing habitat mediocre, in that pool/riffle ratio not uniform (i.e., ratio quite variable from Little Deschutes Campground upstream, ranging from stream reaches of up to 1 mile with all pools, to reaches of the same length with an average of 1:24. The break between pool-deficient and riffle-deficient reaches occurs about 2 miles downstream (north) of Cow Camp, with the pool-deficient area downstream. Optimum resident trout habitat has approximately equal (1:1) proportions of pool and riffle.

### T&E Species

No species are known to utilize this river section.

### Riparian Habitat

Riparian communities along this section of river include grass/sedge meadows and dense willow patches. The latter, located in the lower portions of this section, represent one of the most extensive areas of willow found on the Deschutes National Forest for such dependent wildlife as yellow warbler, Wilson's warbler, and yellowthroat.

# Metolius River

Rainbow trout, brown trout, Dolly Varden, and mountain whitefish are residents in the entire length. Kokanee move from Lake Billy Chinook upstream to the headwaters during spawning.

CY 1977 Fish Production Estimates from Oregon Department of Fish and Wildlife:

Reach from Lake Billy Chinook to Candle Creek Campground:

-Average of 359 resident trout (species not detailed) harvested per river mile, annually.

-Average of 716 fishing recreation days (ODFW definition not coinciding with USFS definition) per river mile, annually.

-Average of about 0.5 (359÷716) resident trout harvested/fishing recreation day/river mile, annually.

-Population of resident trout (species not detailed) maintained by 17 percent natural reproduction, 83 percent hatchery.

Reach from Candle Creek Campground to Metolius Spring:

-Average of 1,232 resident trout harvested per river mile, annually.

-Average of 2,363 fishing recreation days per river mile, annually.

-Average of about 0.5 (1,232÷2,363) resident trout harvested/ fishing recreation day/river mile, annually.

-Population of resident trout maintained by 25 percent natural reproduction, 83 percent hatchery.

Total, from Lake Billy Chinook to Metolius Spring:

-Average of 693 resident trout harvested per river mile, annually.

-Average of 1,346 fishing recreation days per river mile, annually.

-Average of about 0.5 (693÷1,346) resident trout harvested/fishing recreation day/river mile, annually.

-Population of resident trout maintained by 20 percent natural reproduction, 80 percent hatchery.

Habitat information available dates back to 1938, and is too old to still be accurate for existing conditions. Steam survey data was collected this summer, but has not been tabulated and is therefore not presently available. Should be ready this fall or early winter.

## T&E Species

One bald eagle nest site is located just east of Monty Campground. While the pair of birds may hunt the river itself for both fish and waterfowl, most foraging probably occurs on the upper end of Lake Billy Chinook. No other T&E species are known to occur within the habitat along this river segment.

## Riparian Habitat

Riparian vegetation is predominantly grass/sedge meadows with alder ocassionally present in narrow clumps.

# APPENDIX F

# RESEARCH NATURAL AREAS

## Deschutes National Forest

# APPENDIX F

## Research Natural Areas
## Deschutes National Forest

### INTRODUCTION

In a USDA - Forest Service publication dated 1975 entitled, "Research Natural Area Needs in the Pacific Northwest," Jerry F. Franklin, C.T. Dyrness et al at the Pacific Northwest Forest and Range Experiment Station set forth guidelines for identifying and preserving natural ecological systems.

Research Natural Areas (RNA's) are important elements in Forest Plans. They are tracts of land on which natural features are preserved in as nearly an undisturbed state as possible for scientific and educational purposes. RNA's serve as a standard or baseline for comparison with areas influenced by man, as tracts for ecological and environmental study, and as reserves to protect typical as well as rare and endangered organisms. As baseline areas, field laboratories, and genetic reservoirs, they serve the scientist, the resource manager, and the public.

In the Pacific Northwest there has long been a steadily increasing interest in preserving typical and unique examples of the natural environment by the Federal Agencies, by the States of Oregon and Washington, and by various private groups of professional societies. However, a random accumulation of reserved tracts will not provide the representative system of RNA's needed. Features to be preserved may be important or unique ecosystems, habitats, or organisms and may be terrestrial, freshwater, or marine.

Most tracts selected as Research Natural Areas are those where the features of interest are in as nearly an undisturbed state or natural condition as can be found. They do not necessarily have to be pristine, however, as examples of many ecosystems which are essentially free of human disturbance no longer exist. Research Natural Areas are, ideally, sufficiently large to protect the features of interest from significant unnatural influences.

Region 6, (the States of Oregon and Washington) has been stratified into physiographic provinces covering both States. The Region has been further divided into planning areas. The Deschutes National Forest is in Planning Area IV along with the Ochoco, Fremont, and Winema National Forests. Another USDA - Forest Service publication compiled by William E. Hopkins, dated March 1976 entitled, "Guide to Research Natural Area Needs for Planning Area 4," describes the ecosystems our area can contribute to the Region's total.

## BACKGROUND

The Forest has two (2) existing Research Natural Areas (RNA's) which are the Metolius RNA established June 1931, and Pringle Falls RNA established June 1936. Sixteen (16) potential RNA's were identified in the 1978 Land Management Plan. These 16 areas (tracts) were selected as possible candidates to meet the RNA needs identified in previously-cited publications. The RNA's on the Forest would be part of a Region 6 program requiring 365 tracts that would incorporate 960 individual ecosystems, habitats, or organisms.

The 1978 Land Management Plan selected 11 of the 16 potential RNA's to be protected until detailed studies could be made. Through the current planning effort under the National Forest Management Act (NFMA) we have reviewed all 16 potential RNA's plus any other opportunities that may have been overlooked.

The Research Natural Area Program has been coordinated within Planning Area IV and adjacent National Forests to the west. It has been an effort to locate tracts that serve the RNA needs but at the same time not have a proliferation of duplications with like tracts serving the same purpose. The main theme of our coordination has been to identify the best tracts to serve overall intended purposes and, therefore, eliminate each National Forest trying to do it all by themselves. Our Area IV Ecologist, Dr. William E. Hopkins has taken the lead responsibility in accomplishing this task along with consultation from Dr. Jerry F. Franklin, Chief Plant Ecologist, and Sarah E. Green, Research Natural Area Scientist, from the Forestry Sciences Laboratory at Corvallis, Oregon.

## FINDINGS

Area IV Ecologist, Bill Hopkins, field checked all potential tracts identified in the 1978 Land Management Plan. In addition, using the published guidelines previously mentioned, Bill looked for other candidate tracts for specific needs identified.

The following are brief statements about the potential tracts and their attributes that did not meet RNA needs or the RNA needs could be better served by an alternate tract.

> Basin Creek Drainage - This tract does not satisfy the need in that it is mostly dry lodgepole pine/sedge-lupine on the uplands with a very narrow border of Englemann spruce along the perennial stream. The stream is high quality in terms of size and amount of flow but no grass-herb community exists. Elevation would be in excess of 5500 feet and would not be as desirable as a stream passing through a mixed conifer forest at moderate (4000 to 5000 feet) elevation.

West Lava Cast, Klawhop Lavas, Derrick Lavas, and Crescent Creek Lavas - Following consultation with Larry Chitwood, Forest Geologist, and other geologists, it was determined that locating a lava flow exhibiting pre-Mazama and post-Mazama ash best typified plant and animal succession in Central Oregon. The above-mentioned lavas were selected based on variously aged lava flows but in light of the impact of Mt. Mazama (Crater Lake) ash, a new direction was set to find examples of plant and animal succession on flows that were lightly impacted due to man's activity. Mokst Butte contains both a forested cinder cone that is pre-Mazama and a forested cinder cone that is post-Mazama in addition to a lava flow situation between the two cones that is post-Mazama. Therefore, the above potential tracts have been dropped from further consideration as potential RNA's and replaced by Mokst Butte.

Hidden Cave - Hidden Cave is an ice cave where there is some spring/summer melt creating a wet floor with some standing water. There is no actual spring with perennial flowing water, therefore, this site does not fit the description as identified as an RNA need.

Pine Mountain - This tract was examined for RNA needs and found to be entirely too disturbed by man's activities to fill the needs.

Hidden Pond Cinder Cone - Past logging on Sheridan Mountain was sufficient to make the layout of a meaningful unit very questionable in terms of securing enough land to represent all aspects. Therefore, it does not fit the description as identified as an RNA need.

Siah Butte - Logging from the 1930's and 1940's was still very evident on most of the Buttes in the general area around Siah Butte. In addition, system roads also detracted from the overall desirable nature of the proposed area, therefore, it is no longer under consideration.

Wahena Butte - This Butte is somewhat atypical in terms of height of cone and sparse vegetation. This tract, therefore, is no longer being considered. An adequate substitute has been identified on the Forest.

Lava Top - Cone is atypical in terms of very rocky upper one-third portion of cone and sparse vegetation due to shallow soils. Therefore, it does not meet RNA needs.

After completing field work during the summer of 1981 the following tracts have been determined to meet RNA needs for purposes of research and education. These tracts are candidates to be recommended for inclusion in a preferred alternative for preservation as natural ecosystems in the Research Natural Area Program.

| Potential RNA's | Approximate Acres |
|---|---|
| Cache Mountain | 300 |
| Headwaters of Cultus River | 250 |
| Katsuk Butte | 950 |
| Many Lakes | 700 |
| Mokst Butte | 1,250 |
| Torrey-Charlton | 520 |
| Wechee Butte | 360 |
| TOTAL | 4,330 |

# ESTABLISHMENT REPORT
# FOR THE PROPOSED
# CACHE MOUNTAIN RESEARCH NATURAL AREA
# DESCHUTES NATIONAL FOREST

## Principal Distinguishing Features

Cache Mountain Research Natural Area (RNA) includes approximately 300 acres (122 hectares) of coniferous forest northeast of Mount Washington in the Oregon Cascades (Figure 1). The proposed area is situated two miles (3.2 kilometers) east of the crest of the Cascade Range and is exposed to climatic factors coming through the Santiam Pass. This maritime influence from west of the Cascades creates mesic plant communities in the RNA. Four small lakes are included in the area. They are Peewee Lake, Four O'Clock Lake and Hortense Lake, all five to ten acres (2 to 4 ha.) in size, and 20-acre (8 ha.) Torso Lake.

The forests of the RNA are dominated by lodgepole pine (*Pinus contorta*)[1] and mountain hemlock (*Tsuga mertensiana*) in the west half, and a mixture of Douglas fir (*Pseudotsuga menziesii*), *Abies* species, mountain hemlock, Engelmann spruce (*Picea engelmannii*), western white pine (*Pinus monticola*), lodgepole pine and ponderosa pine (*Pinus ponderosa*) in the east half. Six plant communities have been identified in the RNA ranging from moist meadows through mixed conifer forests to the relatively dry lodgepole/beargrass (*Xerophyllum tenax*) association. The vegetation best fits into the *Abies grandis* Zone[2] of eastern Oregon. The occurrence of mountain hemlock throughout the RNA appears to be a disjunct population from the *Tsuga mertensiana* Zone of western Oregon.

Landscapes within the Research Natural Area include open water, steep-forested drainages, gently sloping glaciated uplands, and complex, rocky slopes. Surface soils are loamy sand with several areas of exposed bedrock. Slopes vary from near zero to 70 percent. The RNA is bounded on the north by the Airstrip Burn '67, on the south by the Santiam Wagon Road, and the east boundary is the base of Cache Mountain and Little Cache Mountain. Wildlife species are abundant and characteristic of mixed stands of the central Cascades. Elevation ranges from 4400 feet (1342 meters) to 4800 feet (1464 m.).

[1] Common and scientific nomenclature follows Hitchcock, Leo C. and Arthur Cronquist, *Flora of the Pacific Northwest*, University of Washington Press, Seattle, Washington, 1973, 730 pages, illustrated.

[2] Franklin, Jerry F. and C.T. Dyrness, *Natural Vegetation of Oregon and Washington*, U.S. Government Printing Office, Washington, D.C., 1973, 417 pages, illustrated.

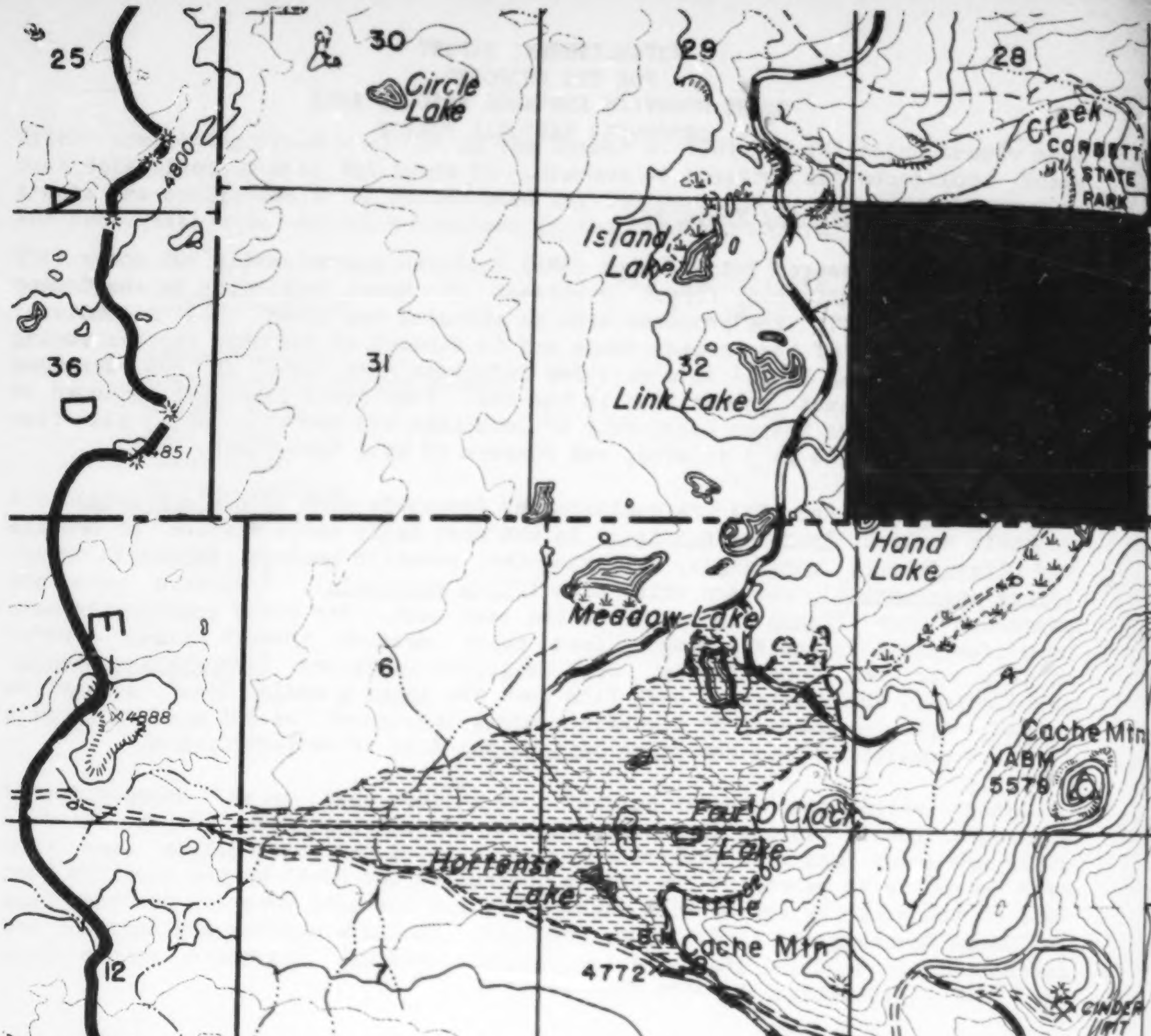
25
30
Circle Lake
29
28
Creek
CORBETT STATE PARK
A
4800
Island Lake
36
31
32
Link Lake
D
4851
Hand Lake
Meadow Lake
E
6
4888
Cache Mtn
VABM 5579
Four O'Clock Lake
Hortense Lake
Little Cache Mtn
BM 4772
12
7
4800
CINDER PIT
4635
5200
13
18
17
16
Creek
5600
Cache
4800
6323
24
19
20
21

**Figure XXIV**

## Justification

Cache Mountain RNA fills the need for a lake at moderate elevations surrounded by mixed-coniferous forest. This is a high priority need identified by the Research Natural Area Needs Workshop in 1973[3]. Four lakes are included in the proposed area at elevations between 4400 feet (1342 m.) and 4720 feet (1440 m.). The mixed-conifer plant community occupies the east half of the RNA with the dominant tree species changing often.

Torso Lake is the largest of the four lakes and is situated on the north boundary of the RNA at an elevation of 4400 feet (1342 m.). It is 20 acres (8 ha.) in size and has a small forested island in the center. The northern half is surrounded by land which has been scarred by wildfire. At the south end is a small wet area dominated by sedges and deciduous shrubs. The surrounding forest is old-growth mixed-conifer with Pacific silver fir (*Abies amablis*) as the climatic climax. A logging road runs along the west and south sides of the lake. Short spur roads are common to the south of the lake and along a nearby Forest Service road. The lake is accessible by vehicle and is heavily used for camping and fishing. Peewee Lake is the most centrally located lake and is 2 to 5 acres (1 to 2 ha.) in size. It is about 1/4 mile (.4 km.) southwest of Torso Lake at an elevation of approximately 4640 feet (1415 m.). The lake is bordered by a narrow region of deciduous shrubs, sedges, and mosses. The surrounding mixed-conifer forest contains lodgepole pine and the climax species is white fir (*Abies concolor*)[4]. This is the only lake in which indian pond lily (*Nuphar polysepalum*) is found. The lake can be reached only by foot. There is minor evidence of human use. Four O'Clock Lake is approximately 1/2 mile (.8 km.) south of Torso Lake. At 4720 feet (1440 m.) it is the highest of the four lakes and apparently the least used. The lake covers 5 to 10 acres (2 to 4 ha.) and has a wide margin of deciduous shrubs dominated by birch (*Betula* species). The encircling forest is marked by many large old-growth Douglas fir among the other coniferous species. This lake is accessible only by foot. A primitive jeep trail leads into Hortense Lake, the most southerly lake. It is found at an elevation of about 4700 feet (1434 m.) and is 10 acres (4 ha.) in size. Hortense Lake has the most extensive border of sedges of all the lakes. Both mixed-conifer and lodgepole pine communities occur in the nearby forests. An intermittent stream originating from the north end of the lake divides the RNA into east and west portions. The shore of this lake shows signs of long-term recreational use. Englemann spruce (*Picea engelmannii*) is present around each of the four lakes. Small meadows of tufted hairgrass (*Deschampsia caespitosa*) are found near Peewee and Hortense Lakes. There is some use of the lakes by waterfowl. Centered between the three smaller lakes is a rocky ridge which supports mountain juniper (Juniperus communis) and other sub-alpine and rock species.

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[3] Dyrness, C.T., Jerry F. Franklin, Chris Maser, Stanton A. Cook, James D. Hall and Glenda Faxon, *Research Natural Area Needs in the Pacific Northwest*, Pacific Northwest Forest and Range Experiment Station, USDA Forest Service, Portland, Oregon, 1975, 231 pages.

[4] Grand fir (*Abies grandis*) and white fir (*Abies concolor*) form a continuously varying biological complex in eastern Oregon. Throughout this report we will refer to the complex as white fir (Abies concolor).

The mixed-conifer forest of the RNA is composed of Douglas fir, Pacific silver fir, white fir, mountain hemlock, Engelmann spruce, lodgepole pine, ponderosa pine, and western white pine. Some understory dominants are big huckleberry (Vaccinium membranaceum), braken fern (Pteridium aquilinum), beargrass (Xerophyllum tenax), and starry solomon-plume (Smilacina stellata). Pacific silver fir is the climax (true species) in the northeastern portion of the RNA and white fir in the drier western portion. Other communities in the RNA include moist (hairgrass) meadows, lodgepole pine wetlands, Englemann spruce bottomlands and lodgepole-beargrass associations. Large old-growth Douglas fir around 60 inches (152 centimeters) DBH[5] are scattered throughout the more mesic eastern half of the proposed area. Large mountain hemlock are foundin every part of the RNA and are strikingly evident in the lodgepole-beargrass community found in the western half of the area. Mountain hemlock appears as disjunct stands within the proposed area. The area offers examples of fire climax situations in which Douglas fir, lodgepole pine, and ponderosa pine are dominant tree species but are considered seral. Adding to the diversity of vegetation is the shading influence of Cache and Little Cache Mountains on the eastern portion of the RNA.

The proposed Cache Mountain RNA is located in the midst of highly productive commercial forest land. A 20-acre (8 ha.) section has been recently logged. The RNA is also in an area of heavy recreational use. Human use is evident along the north and south boundaries and at most of the lakes.

The RNA provides an opportunity to study mid-elevation aquatics in a mixed-conifer community. Studies might include effect of elevation and surrounding vegetation on aquatic life. Other research could involve the influence of maritime climate on the vegetation of eastern Oregon. The area offers a wide variety of microclimates and reserach might include the relationship of plant communities to changes in topography, soil depths, aspects, percent slope, and soil moisture. Major vegetation studies could be directed toward fire climax versus climatic climax. Opportunties also exist in areas relative to recreation, fauna, and timber management.

## Location

The proposed Cache Mountain Research Natural Area occupies approximately 300 acres (122 ha.) in the Deschutes National Forest, Sisters Ranger District. It lies at North Latitude 44°22' and West Longitude 121°48'. The tract is located in Deschutes County 14 air miles (23 km.) west-northwest of Sisters, Oregon. The RNA includes portions of sections 5, 6, 7, and 8 of T. 14 S., R. 8 E., and secs. 1 and 12 of T. 14 S., R. 7-1/2 E., W.M.

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[5] DBH is an abbreviation of diameter-breast-height and is the diameter of the steam measured 54 inches (137 cm.) above ground level.

It is possible to reach the RNA from two directions. For access from the north travel State Highway 126 northwest from Sisters, Oregon. In about 17 miles (27 km.), 4 miles (6.4 km.) past the Suttle Lake road, turn left on Forest Road 1316 to Elliot R. Corbett II Memorial State Park. Follow this cindered road for 3 miles (4.8 km.) and turn left onto an unmarked cindered road. This is Forest Road 1316A which gives access to the extreme northeast portion of the RNA. To reach Torso Lake continue on the main road No. 1316 and turn left on the dirt road immediately after No. 1316A. The lake can be seen from the main road. The fire road which forms most of the north boundary of the RNA begins at Torso Lake and runs west. It is suitable for foot or ATV travel. Numerous short spur roads into the RNA branch off from this fire road. For access to the southern portion of the RNA again take State Highway 126 northwest from Sisters, Oregon. In 11 miles (18 km.) turn left onto Forest Road 1423, following signs to Cache Mountain and Toll Station. Pass the Toll Station in about 6 miles (9.7 km.) following signs to Cache Mountain. In 2 miles (3.2 km.) the cindered road will turn into dirt road No. 1315. A jeep trail to the right in about 1/4 mile (.4 km.) leads into Hortense Lake. Continue on Road 1315 to travel the south border of the RNA and for access by foot to the interior.

Community Types

The major influences upon forest composition within the RNA appear to be fire and available soil moisture. Seral species such as lodgepole pine, ponderosa pine, Douglas fir, and western white pine are maintained by fire. The climatic climax species, white fir and Pacific silver fir, appear only in the absence of fire. The variety within each plant community of the RNA is compounded by the effects of changing slope, aspect, landform and soil type on soil moisture. Ecologically, the communities encountered in the Cache Mountain RNA best fit into the *Abies grandis* Zone of eastern Oregon with an additional disjunct population from the *Tsuga mertensiana* Zone. Soil drought is of minor significance. Soils exhibit minimal development but have relatively deep accumulations of volcanic ash. Tree species in order of abundance are white fir, lodgepole pine, mountain hemlock, Douglas fir, Pacific silver fir, Engelmann spruce, western white pine, and ponderosa pine. White fir is the major climax species in the western portion of the RNA with some areas where mountain hemlock may be minor climax or major seral. In the eastern segment of the RNA Pacific silver fir is the major climax.

Fire has been the most important factor in instigating seral stands dominated by lodgepole pine and Douglas fir. Present in limited numbers and localized areas are Engelmann spruce and western white pine. Many of the seral species reach optimum development in the *Abies grandis* Zone.

Throughout the Cache Mountain RNA mountain hemlock occurs as scattered old growth and regeneration. Within the western portion of the RNA where lodgepole pine is the major seral species, stands occur in which mountain hemlock is dominant. In these stands hemlock is present in all ages and its regeneration is equal to that of the white fir. The stands of mountain hemlock found in the Cache Mountain area exhibiting some similarity to the west side *Tsuga mertensiana* Zone are seen in the mixed-conifer community where mountain hemlock dominates the overstory, in that section of the RNA where Pacific silver fir is climax, and in the occurrence of seral lodgepole forests.

Five plant communities have been identified in the RNA and may be correlated to Volland's types[6] as follows:

| Unit | Plant Community | Location | Acreage |
|---|---|---|---|
| 1 | Moist (hairgrass) meadow MM-19 | 1/4 mile (.4 km.) north of Peewee Lake, 1/4 mile south of Hortense Lake | 2<br>(.8 ha.) |
| 2 | Lodgepole/blueberry/ forb wetland CL-M3-11 | 1/10 mile (.16 km.) south and east of Four O'Clock Lake | 5<br>( 2 ha.) |
| 3 | Engelmann spruce bottomlands CW-C9-11 | On shore of three smaller lakes | 20<br>( 8 ha.) |
| 4 | Mixed conifer/snow-berry/forb CD-S6-13 | East half of RNA | 113<br>(46 ha.) |
| 5 | Lodgepole pine/ beargrass CL-M4-11 | West half of RNA | 150<br>(61 ha.) |

The moist (hairgrass) meadows of the RNA are permanent nonforest communities. They are nonsuccessional herbaceous plant communities which occupy small, moist, essentially flat areas of the forest. At this time two have been found in the Cache Mountain RNA. One is located just south of the fire road that forms the north boundary of the RNA and is about 1/4 mile (.4 km.) due north of Peewee Lake. The other meadow is divided by the jeep trail that leads to Hortense Lake from the south boundary. Each is approximately one acre (.4 ha.) in size. Both meadows are in excellent condition and are dominated by tufted hairgrass (*Deschampsia caespitosa*), beaked sedge (*Carex rostrata*), black alpine sedge (*Carex nigricans*), Baltic rush (*Juncus balticus*) and mosses.

An isolated area of lodgepole pine/blueberry/forb wetland is found in a depression southeast of Four O'Clock Lake. It covers about 5 acres (2 ha.) and appears to be seasonally ponded. Lodgepole pine is a topo-climac here due to the wet soil and concave landform. The growth of the lodgepole is somewhat stunted with trees averaging 80 feet (24 m.) in height and 8 inches (20 c.) d.b.h. Basal area averages 90 feet$^2$/acre (21 meters$^2$/hectare). Regeneration is predominately lodgepole. Large western white pine are found on the edges of the area. Dominant understory species are big huckleberry, grouseberry (*Vaccinium scoparium*), western bog blueberry (*Vaccinium occidentale*), and bearberry honeysuckle (*Lonicera involucrata*). The ground cover is primarily mosses with a few fescue (*Festuca* species) and cinquefoil (*Potentialla* species).

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[6] Volland, Leonard A., *Plant Associations of the Central Oregon Pumice Zone*, USDA Forest Service Pacific Northwest Region, Portland, Oregon, September, 1982, R6-Ecol-104-1982, 122 pages.

Engelmann spruce bottomlands surround the three smaller lakes in the RNA. Engelmann spruce is present as mature trees in the overstory. Some of the largest individuals occur around Hortense Lake, up to 40 inches (102 cm.) in diameter and 130 feet (40 m.) in height. Occurrence of other tree species is the same as in the surrounding mixed conifer community. Spruce comprises approximately ten percent of the stand of lodgepole pine, Douglas fir, some mountain hemlock and western white pine, and occasional ponderosa pine. The spruce appears to be a seral species as little regeneration is found. Dominant understory species are big huckleberry, starry solomon-plume, western solomonplume (*Smilacina racemosa*), and western twinflower (*Linnaea borealis*). The Engelmann spruce bottomlands community is represented in a very narrow zone immediately around the lakes. There is very little differentiation between this community and the surrounding mixed-conifer community except for the presence of the spruce. The spruce community is not found around Torso Lake. In that mesic region of the RNA Engelmann spruce is a common component of the old-growth mixed-conifer forest and no change in vegetation occurs at Torso Lake.

The mixed-conifer/snowberry/forb community has great variation within the RNA. In the most mesic northeast portion of the RNA this community is dominated by old-growth forest composed of Douglas fir, mountain hemlock, Engelmann spruce, western white pine, and ponderosa pine with understory species of Pacific silver fir and white fir. In this area southeast of Torso Lake Pacific silver fir is the climatic climax. The canopy is about 160 feet (49 m.) above ground and stems average between 24 and 40 inches (61 to 102 cm.) d.b.h. Douglas fir up to 60 inches (152 cm.) in diameter are common. Pacific silver fir averages 80 feet (24 m.) tall and 10 inches (25 cm.) in diameter. White fir is represented as sparse regeneration only. Few lodgepole pine are present in this area. Total basal area approaches 260 feet$^2$/acre (61 meters$^2$/ha.). The herbaceous layer is scanty with dominants of big huckleberry, starry solomon-plume and queen's cup (*Clintonia uniflora*). On another site 1/4 miles (.4 km.) to the southwest Pacific silver fir is absent, Douglas fir is dominant, white fir more common and occasional old-growth ponderosa pine is present. The forb component becomes much richer with additions of sidebells pyrola (*Pyrola secunda*), white trillium (*Trillium ovatum*), wild ginger (*Asarum caudatum*) and others. West of Four O'Clock Lake mountain hemlock is dominant and lodgepole pine begins to appear. On more xeric sites further west substantial increase in basal area of lodgepole pine and white fir is noted. In most of these drier microclimates the tree species exist as pole stands. Total basal areas are as low as 120 feet$^2$/acre (30 meters$^2$/ha.). Common within all the variations of the mixed conifer community are scattered old-growth Douglas fir up to 60 inches (152 cm.) in diameter, large western white pine, all ages of mountain hemlock and beargrass and braken fern. Another variation of this community is situated on the rocky ridge centered between the three smaller lakes. Pole-size Douglas fir, lodgepole pine, white fir, and mountain hemlock are present on top of the ridge. Shrubby species are mountain juniper, green-leaf manzanita (Arctostaphylos patula), pinemat manzanita (Arctostaphylos nevadensis), golden chinquapin (Castanopsis chrysophylla), myrtle pachistima (Pachistima myrsinites), and gland oceanspray (Holodiscus dumosus). Shrubs dominate the understory and forbs are represented by Aster species, and cliff penstemon (Penstemon rupicola). Pinegrass (Calamagrostis rubencens), long-stolon sedge (Carex pensylvanica) and beargrass are common ground cover.

The lodgepole pine/beargrass community dominates the western half of the RNA. Trees average 90 feet (27 m.) in height and 10 inches 25 cm.) d.b.h. Regeneration is white fir and mountain hemlock. Understory dominants are big huckleberry, grouseberry, beargrass, and pinegrass. Total basal area for all tree species averages 140 feet$^2$/acre (33 meters$^2$/ha.). Mountain hemlock is highly visible in this portion of the RNA. Mature hemlock with varying amounts of regeneration is scattered throughout the community. Its occurrence ranges from near zero to sites where it is dominant over lodgepole. Lodgepole is the major seral species and white fir the climatic climax. The presence of mountain hemlock east of the Cascades has been interpreted as an indicator of the sub-alpine Abies lasiocarpa Zone but is known to occur only in the northern Cascades of Washington and in the Wallowa Mountains of northeastern Oregon. Many similarities exist between the vegetation of Cache Mountain RNA and that of the Tsuga mertensiana Zone of western Oregon and the Cascade crest as discussed earlier. Mountain hemlock within the RNA appears to be a disjunct stand from the Tsuga mertensiana Zone. However, in this case mountain hemlock appears to be a climax in this area.

Additional communities in the RNA not cataloged by Volland include the aquatic communities of the four lakes and the narrow riparian zone around each lake. The lakes are clear, cold, and oligotrophic. Estimated maximum depth is 30 feet (9 m.). Yellow pond lily is the only vascular plant in evidence. The riparian zone is shrub dominated and varies in width from lake to lake. At its maximum it is approximately 20 feet (6 m.) wide. Birch (Betula species) and big huckleberry dominate the shrub layer in which Scouler willow (Salix scouleriana) and Menzies' spirea (Spirea douglasii var. menziesii) also occur. The herbaceous layer is dominated by starry solomon-plume, western solomon-plume and western twinflower.

Cache Mountain Research Natural Area falls within Kuchler's[7].

It is also included in the SAF Cover Type.[8]

[7] Kuchler, A.W., Potential Natural Vegetation of the Conterminous United States, American Geographical Society, Special Publication Number 36, illustrated.

[8] Society of American Foresters, Forest Cover Types of North America, Exclusive of Mexicol, Society of American Foresters, Washington, D.C., 1954, 67 pages, illustrated.

Table 1. Partial list of vascular plants of Cache Mountain Research Natural Area

| | Scientific Name | Common Name |
|---|---|---|
| TREES | Abies amablis | Pacific silver fir |
| | Abies concolor | white fir |
| | Picea engelmannii | Engelmann spruce |
| | Pinus contorta | lodgepole pine |
| | Pinus monticola | western white pine |
| | Pinus ponderosa | ponderosa pine |
| | Pseudotsuga menziesii | Douglas fir |
| | Tsuga mertensiana | mountain hemlock |
| SHRUBS | Acer circinatum | vine maple |
| | Amelanchier alnifolia | western serviceberry |
| | Arctostaphylos nevadensis | pinemat manzanita |
| | Arctostaphylos patula | green-leaf manzanita |
| | Berberis repens | creeping oregongrape |
| | Betula species | birch species |
| | Castanopsis chrysophylla | golden chinquapin |
| | Holodiscus dumosus | gland ocean-spray |
| | Juniperus communis | mountain juniper |
| | Lonicera involucrata | bearberry honeysuckle |
| | Pachistima myrsinites | mountain lover |
| | Ribes lacustre | prickly currant |
| | Ribes viscosissimum | sticky currant |
| | Rosa gymnocarpa | baldhip rose |
| | Rubus parviflorus | thimbleberry |
| | Rubus ursinus | Pacific blackberry |
| | Salix scouleriana | Scouler willow |
| | Sambucus cerulea | blue elderberry |
| | Symphoricarpos albus | common snowberry |
| | Vaccinium membranaceum | big huckleberry |
| | Vaccinium occidentale | western bog blueberry |
| | Vaccinium scoparium | grouseberry |
| GRASSES | Calamagrostic rubescens | pinegrass |
| | Deschampsia cespitosa | tufted hairgrass |
| | Festuca species | fescue species |
| | Sitanion hystrix | bottlebrush squirreltail |
| | Stipa occidentalis | western needlegrass |
| SEDGES and RUSHES | Carex nigricans | black alpine sedge |
| | Carex pensylvanica | long-stolon sedge |
| | Carex rostrata | beakes sedge |
| | Juncus balticus | Baltic sedge |

| | | |
|---|---|---|
| **FORBS** | Achillea millefolium | western yarrow |
| | Anaphalis margaritacea | pearly-everlasting |
| | Anemone deltoidea | threeleaf anemone |
| | Aquilegia formosa | red columbine |
| | Arabis species | rockcress species |
| | Asarum caudatum | wild ginger |
| | Aster subspisatus | Douglas' aster |
| | Chimaphila menziesii | little prince's-pine |
| | Chimaphila umbellata | prince's-pine |
| | Cirsium vulgare | common thistle |
| | Clintonia uniflora | queen's cup |
| | Fragaria vesca | woods strawberry |
| | Fragaria virginiana | broadpetal strawberry |
| | Galium aparine | cleavers |
| | Gilia aggregata | scarlet gilia |
| | Goodyera oblongifolia | western rattlesnake-plantain |
| | Hieraceum albiflorum | white hawkweed |
| | Hypopitys monotropa | fringed pinesap |
| | Lilium columbianum | tiger lily |
| | Linnaea borealis | western twinflower |
| | Lupinus wyethii | Wyeth's lupine |
| | Mimulus species | monkey-flower species |
| | Montia parvifolia | streambank spring beauty |
| | Nuphar polysepalum | Indian pond lily |
| | Osmorhiza chilensis | mountain sweet-cicely |
| | Pedicularis racemosa | leafy lousewort |
| | Penstemmon cinicola | ash penstemmon |
| | Penstemmon montanus montanus | mountain beardtongue |
| | Penstemmon rupicola | cliff penstemmon |
| | Phacelia hastata | white-leaf phacelia |
| | Potentialla species | cinquefoil species |
| | Pteridium aquilinum | braken fern |
| | Pyrola secunda | sidebells pyrola |
| | Smilacina racemosa | western solomon-plume |
| | Smilacina stellata | starry solomon-plume |
| | Solidage species | goldenrod species |
| | Tiarella trifoliata | coolwort foamflower |
| | Trillium ovatum | white trillium |
| | Viola species | violet species |
| | Xerophyllum tenax | beargrass |

## Protection and Management

See direction in Forest Plan for Research Natural Areas.

TIMBER RESOURCES: Cache Mountain RNA

The existing timber resources are best described as a composite of "stands." The 1978 stand mapping and classification project included all Proposed Research Natural Areas and is used as the basic description of Timber Resources.

# ESTABLISHMENT REPORT FOR THE PROPOSED
# HEADWATERS OF THE CULTUS RIVER RESEARCH NATURAL AREA
# DESCHUTES NATIONAL FOREST

## Principal Distinguishing Features

The Headwaters of the Cultus River Research Natural Area (RNA) is a 250-acre (101 hectare) area located on the east slope of the Oregon Cascades. This part of Central Oregon is noted for extensive pumice deposits and numerous lava flows. The central feature in the RNA is a series of large, perennial springs emerging from the base of Bench Mark Butte (Figure 2). The butte is composed of a broken lava flow with short steep pitches and draws, ending in a 150-foot (46 meter) slope of blocky basalt. Old growth ponderosa pine (*Pinus ponderosa*)[1] with an understory of mixed conifers dominates the vegetation of the butte. The Cultus River emerges from the base of Bench Mark Butte approximately 50 feet (15 m.) wide and 12 inches (30 centimeters) deep. It seldom reaches depths of over 2 feet (.6 m.) within the RNA. The river is clear, cold, and fast flowing. Several tributary streams also originate from the butte. Spawning populations of trout and kokanee utilize the river in the fall. The portion of the RNA below the butte is a nearly flat, glaciated plain with well-drained, coarse-textured pumice soil. Plant communities vary with distance from the River. Engelmann spruce (*Picea engelmanii*) is found in the river banks and grades into lodgepole pine (*Pinus contorta*) away from the river. This is a moist lodgepole community with abundant understory and herbaceous layer. Furthest from the Cultus River the lodgepole stands are associated with scattered bitterbrush and scant ground cover. Prominent wildlife species include Roosevelt elk, mule deer, coyote, bobcat, bluegrouse, bald eagle, osprey, great blue heron, racoon, and otter (Table 3). Many smaller mammals are also present. The area is bounded on three sides by system roads and on the north by a primitive jeep trail. Overall slope is less than 10 percent with a southerly aspect. Elevational limits are 4450 feet (1357 m.) to 4700 feet (1434 m.).

## Justification

The Headwaters of the Cultus River RNA fills the need for a large, upwelling cold spring as identified by the Research Natural Area Needs Workshop in 1973.[2] Cultus River emerges from the base of a 150-foot high (46 m.) toeslope

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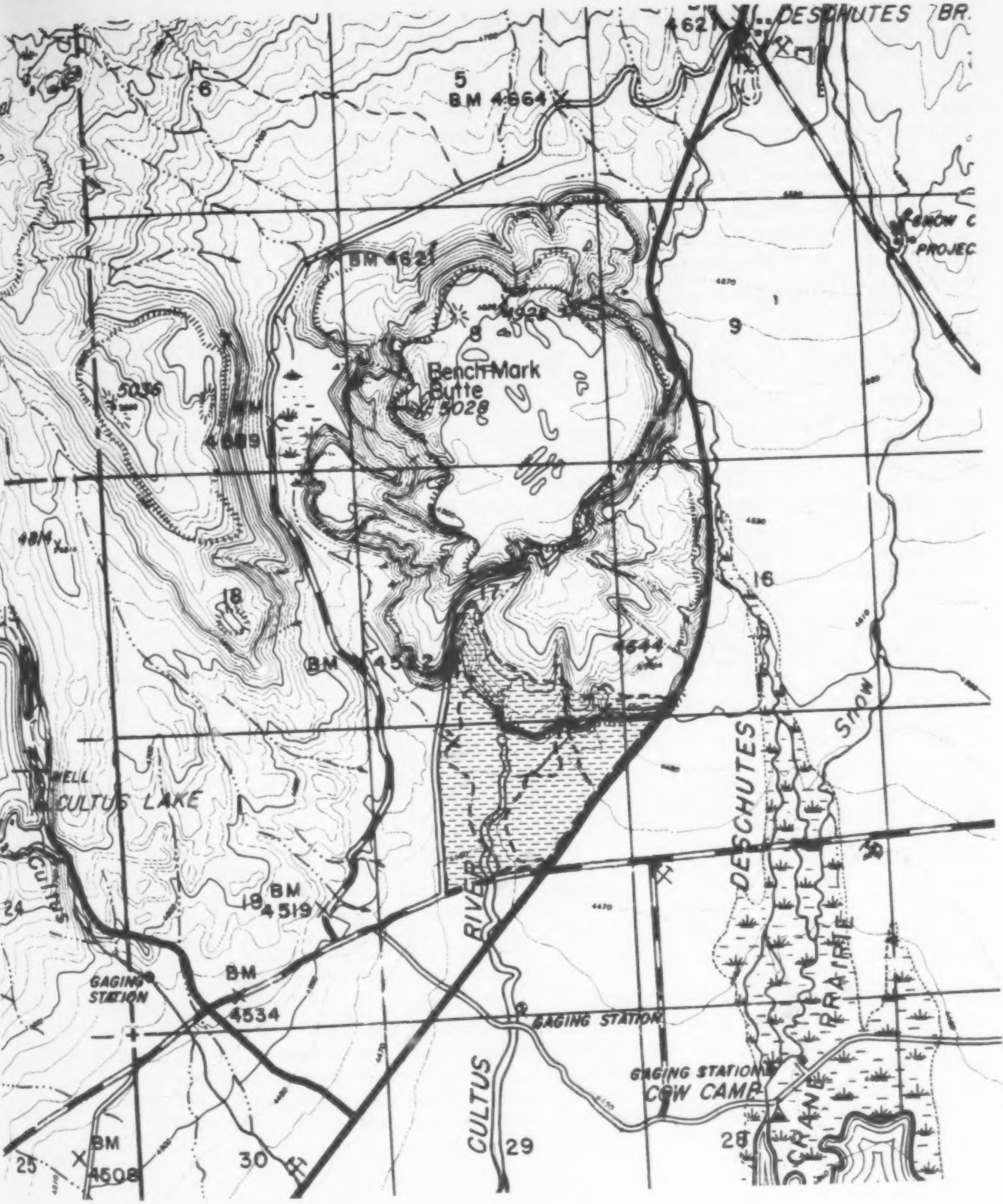
[1] Common and scientific names follow Hichcock, Leo C. and Arthur Cronquist, *Flora of the Pacific Northwest*, University of Washington Press, Seattle, Washington, 1973, 730 pages, illustrated.

[2] 2 Dyrness, C.T., Jerry F. Franklin, Chris Maser, Stanton A. Cook, James D. Hall, and Glenda Faxon, *Research Natural Area Needs in the Pacific Northwest*, Pacific Northwest Forest and Range Experiment Station, USDA Forest Service, Portland, Oregon, 1975, 231 pages.



4621
DESCHUTES BR.
5
BM 4864
6
BM 4621
4926
8
Bench Mark Butte
5028
5036
BM 4689
SNOW C
PROJEC
9
1
16
18
BM 4522
4644
SNOW
DESCHUTES
WELL
CULTUS LAKE
CULTUS
24
19
BM 4519
RIVER
4470
PRAIRIE
CRANE
GAGING STATION
BM 4534
GAGING STATION
GAGING STATION
COW CAMP
CULTUS
29
28
25
BM 4508
30

Figure XXV

of blocky basalt. This slope is the terminus of the lava flow which forms Bench Mark Butte. The river is nearly 50 feet (16 m.) wide at its origin and abut 12 inches (30 cm.) deep. Along the base of the butte are several other springs which form tributary streams contributing to the river. Two of these streams are seasonal and produce a variety of terrestrial and aquatic vegetation. These wet areas support an Engelmann spruce community with seral lodgepole pine and understory of white fir (*Abies concolor*), Douglas fir (*Pseudotsuga menziesii*), and mountain hemlock (*Tsuga mertensiana*). Numerous shrub species are present and forbs, sedges, and grasses are abundant.

The slope of the Butte above the origin of the river supports a shrub dominant vegetation of bitterbrush (*Purshia tridentata*), green-leaf manzanita (*Arcotostaphylos patula*), snowbrush (*Ceanothus velutinus*), and gland ocean-spray (*Holodiscus dumosus*). The top of the butte has a varying topography of short benches and scattered drainages. Ponderosa pine dominates the overstory with some as large as 170 feet (52 m.) in height and 50 inches (127 cm.) in diameter. Regeneration consists of Douglas fir, white fir, western hemlock, ponderosa pine, lodgepole pine, and Engelmann spruce. Dominant understory species are prince's-pine (*Chimaphila umbellata*) and pinegrass (*Calama-grostis rubescens*). The butte has been selectively logged and many overgrown skid roads are evident. Old growth Douglas fir was the apparent object of the logging.

As distance from the River increases, the Engelmann spruce grades into a moist lodgepole pine community with some large white fir. The understory is represented by regeneration of lodgepole, Engelmann spruce, Douglas fir, and western white pine (*Pinus monticola*). The shrub layer becomes less dense further from the river and grasses become more important. This lodgepole community gradually becomes a dry lodgepole type with a scant ground layer of bitterbrush, squaw carpet (*Ceanothus prostratus*), grasses, and sedges. The seasonally wet tributary streams support a variety of vegetation and represent several community types. Each channel differs in the length of time water is present during the year. These streams typify successional stages from stream to meadow to forest.

The RNA is located in the midst of typical commercial forest land. The proposed north, west, and southern boundaries border active timber sales and public cutting areas. The RNA is bounded on the east by the heavily used Cascade Lakes Highway. There is some evidence of human impact, primarily along the west and southern limits of the RNA. On the west boundary there are several fire pits and vehicle turnouts within the proposed area. A few trees have been cut for firewood. On the southern edge a graveled turnout exists on the west side of the river. There is also a game trail running north along the west side of the river which shows evidence of human use.

The Headwaters of the Cultus River offers a prime example of large, upwelling cold springs. The RNA also exhibits a wide range of habitats related to soil moisture, topography, and soil type. Soil moisture is reflected by vegetation types ranging from aquatic to mixed conifer to lodgepole-bitterbrush. Land types include a broken lava flow, basalt toeslope, open water, and pumice covered glacial plain. Soil types vary from exposed basalt to loamy sand. The

RNA provides an opportunity to study riparian vegetation communities and their relationship to upland dry sites. Studies might include comparison of species and water table, topography, or soil parent material. Additional research could involve stream-meadow-forest succession. Acquatic studies could also be done within the RNA, as well as various comparisons contrasting the butte and the river bottomlands.

## Location

The proposed Headwaters of the Cultus River Research Natural Area occupies approximately 250 acres (101 ha.) in the Deschutes National Forest at North Latitude 43°50', West Longitude 121°46'. The tract is located in Deschutes County, 29 air miles (46 kilometers) southwest of Bend, Oregon. The boundaries of the RNA are accessible by the Cascade Lakes Highway on the east, Forest Road 2022 on the south, and Forest Road 2022B on the west. In addition, the north edge is bounded by a primitive jeep trail. The interior of the RNA can be reached by foot and only primitive game trails exist at this time. The RNA is located in secs. 17 and 20 of T. 20 S., R. 8 E., W.M.

To reach the Cultus River follow signs in Bend, Oregon, towards Century Drive and Bachelor Butte. Century Drive becomes the Cascade Lakes Highway outside of the city limits. Follow the Cascade Lakes Highway approximately 36 miles (58 km.) past Elk Lake and the Lava Lakes. In another 5 miles (8 km.) the RNA will be on the right and a Forest Service sign for Road 2022 will follow. Turn right onto 2022 to travel the southern boundary of the Natural Area.

## Community Types

The major influences on the forest composition within the RNA are soil type and soil moisture. A sharp contrast exists between species found on the broken lava of the butte and species found on the glacial till below the butte. Community changes also occur below the Butte along a gradient based on distance from the river. In addition, microhabitats exist on the edge of the lava flow forming Bench Mark Butte, and in the seasonally wet streams of the river. Tree species in order of abundance below the butte are lodgepole pine, Engelmann spruce, ponderosa pine, white fir, Douglas fir, silver fir (*Abies amablis*), and western pine. On top of the butte the order becomes ponderosa pine, lodgepole pine, Douglas fir, white fir, mountain hemlock, and Engelmann spruce. Ecologically, the communities encountered in the RNA best fit into the *Abies grandis-Abies concolor* Zone of South-Central Oregon.[3] This Zone is characterized by less extreme moisture and temperature regimes than other Eastern Oregon zones. It has generally higher precipitation and lower temperatures than lower forested zones and higher temperatures with less snow accumulation than sub-alpine zones. Soils generally exhibit minimal development. Lodgepole pine, ponderosa pine, and Douglas fir often dominate seral stands in the Zone. Engelmann spruce may be present in localized wet and frosty areas.

Four plant associations are represented in the RNA and may be roughly correlated to Volland's community types[4] as follows:

| Unit | Plant Community | Location | Acreage |
|---|---|---|---|
| 1 | Engelmann spruce bottomlands, CW-C9-11 | Nearest river and tributaries | 90 |
| 2 | Lodgepole/blueberry/forb wetland CL-M3-12 | Moist areas near river | 40 |
| 3 | Lodgepole/bitterbrush/sedge CL-S2-12 | Dry pumice flats furthest from river | 40 |
| 4 | Ponderosa/bitterbrush-manzanita/needlegrass CP-S2-13 | Top of butte | 80 |

Unit 1 is located along the river and near its tributary streams. The dominant tree species, Engelmann spruce, is associated with wet areas within the forests of Central Oregon. Most of this community in the RNA occurs within 100 feet of open water. All ages of spruce are present with an average basal area of 100 feet$^2$/acre (23.3 meters$^2$/ha.). The average size of the spruce approximates 70 feet (21 m.) in height and 11 inches (28 cm.) d.b.h. The largest have a diameter of 34 inches (86 cm.) and are about 90 feet (27 m.) tall. Many mature lodgepole pine are present in this unit along with regeneration under 20 feet (6 m.). The mature lodgepole averages 100 feet (31 m.) in height and 12 inches (31 cm.) d.b.h. A few lodgepole snags are also near the River. The basal area of the lodgepole varies from near zero to 100 feet$^2$/acre (23.3 meters$^2$/ha.) among the spruce. The canopy within the unit is fairly open with about 60 percent cover. A few dense spruce patches occur along riverbanks with a nearly closed canopy.

White fir occurs in the understory reaching heights of 50 feet (15 m.) and diameters of 5 inches (13 cm.). Western twinflower (*Linnaea borealis*), black alpine sedge (*Carex nigricans*), and beaked sedge (*Carex rostrata*) dominate the ground cover. A variety of low shrub species are included in this unit, but in no greater numbers. The slope of the unit is near zero.

[3] Franklin, Jerry F. and Dyrness, C.T., *Natural Vegetation of Oregon and Washington*, U.S. Government Printing Office, Washington, D.C., 1973, 417 pages, illustrated.

[4] Volland, Leonard A., Plant Associations of the Central Oregon Pumice Zone, USDA Forest Service Pacific Northwest Region, Portland, Oregon. September, 1982. R6-Ecol-104-1982. 122 p.

Unit 2 appears not far from the river and its tributaries where the water table is shallow year-round. Lodgepole pine is the dominant tree species and is present as a two-aged stand. Mature trees average 100 feet (31 m.) in height and 8 inches (20 cm.) in diameter with dense regeneration about 20 feet (6 m.) tall. The largest lodgepole reach 120 feet (37 m.) in height and d.b.h. of 14 inches (36 cm.). Average basal area is 120 feet$^2$/acre (28 meters$^2$/ha.). The abundance of soil moisture within this unit creates a climax lodgepole forest with occasional pole sized white fir, and silver fir. Species present as regeneration include Douglas fir, mountain hemlock, Engelmann spruce, ponderosa pine, and western white pine. Common shrub species are pinemat manzanita (*Arctostaphylos nevadensis*), prince's-pine, and big huckleberry (*Vaccinium membranaceum*). Pinegrass dominates the ground cover and many species of forbs are present.

In Unit 3 the decrease in soil moisture becomes more obvious. Few tree species other than the climax lodgepole pine are found. Ponderosa pine and white fir saplings are rare. The lodgepole stand is two-aged and less dense than the Unit 2 with a basal area of 100 feet$^2$/acre (23.3 meters$^2$/ha.). The shrub layer is scattered on the dry pumice soil, with bitterbrush dominant. Squaw carpet and pinemat manzanita are common shrubs, squaw currant (*Ribes cereum*) and snowbrush, occasional. Long stolon sedge (*Carex pensylvanica*) dominates the sparse ground cover. Several species of grasses are also present. Dominant forbs are broad-petal strawberry (*Fragaria virginiana*), prairie lupine (*Lupinus lepidus*), and American vetch (*Vicia americana*). Percent slope for both Units 2 and 3 are near zero.

Unit 4 represents the ponderosa pine/bitterbrush-manzanita/needlegrass plant community of Bench Mark Butte. Old growth ponderosa pine dominates the broken lavas for the butte. The largest individuals reach 170 feet (52 m.) in height and 50 inches (127 cm.) d.b.h. Many are in the range of 160 feet (49 m.) tall with diameters of 30 inches (76 cm.). Most of these bear deep fire scars. Other tree species are present only as regeneration including Douglas fir, lodgepole pine, white fir, Engelmann spruce, and mountain hemlock. There is also a small amount of ponderosa pine regrowth. It appears from the size and number of Douglas fir stumps on the butte, that Douglas fir may have been codominant with ponderosa pine before the area was logged. Stumps are as large as 60 inches (152 cm.) in diameter. Based on reproductive success ponderosa pine and Douglas fir are seral species with white fir the climax species. Total basal area for all tree species approximates 120 feet$^2$/acre (28 meters$^2$/ha.). In the shrub layer bitterbrush and green-leaf manzanita are present in generally equal amounts and there is a scattering of snowbrush. Lower shrubs such as prince's-pine, squaw carpet, and grouse huckleberry (*Vaccinium scoparium*) are most prevalent. On the overgrown skid roads greenleaf and pinemat manzanita are most common. Pinegrass and long stolon sedge dominate many areas of the herbaceous layer. Common forbs include broadpetal strawberry, fireweed (*Epilobium angustifolium*), ash penstemmon (*Penstemon cinicola*) and white-flowered hawkweed (*Hieraceum albiflorum*).

The Headwaters of the Cultus River Research Natural Area falls within Kuchler's.[5]

It is also included in the SAF Cover Type.[6]

## Physical and Climatic Conditions

The RNA is composed of two major topographic types. Bench Mark Butte is an old lava flow composed of a series of benches with numerous rock outcroppings and steep drainages. The rough broken lavas support a stony, shallow soil which is readily permeable. The overall slope of the butte is less than 10 percent with a southerly aspect. The terminus of the butte is a 50 percent slope of sparsely vegetated blocky basalt. The Cultus River emerges at the base of the 150 foot (46 m.) slope from under the large basalt stones. The area below the butte is a flat, glaciated plain covered with a fine pumice soil. Elevation is approximately 4450 feet (1357 m.) near the river and 4700 feet (1434 m.) at the highest point on the butte within the RNA.

The climate of Central Oregon is typified by cold winters, hot summers, a short growing season, and low annual precipitation. Wide diurnal temperature fluctuations of 10°C to 16°C are common. The summers are very dry and a high proportion of annual precipitation falls as snow. The nearest weather record is at Wickiup Dam, 11 miles (18 km.) to the southeast of the Cultus River. The data in Table 2 is an average of the period from 1944 to 1978 at Wickiup Dam.

[5] Kuchler, A.W., Potential Natural Vegetation of the Conterminous United States, American Geographical Society, Special Publication Number 36, 1964, illustrated.

[6] Society of American Foresters, Forest Cover Types of North America, Exclusive of Mexico, Society of American Foresters, Washington, D.C., 1954, 67 pages, illustrated.

Table 1. Partial list of vascular plants of Headwaters of the Cultus River Research Natural Area

| | Scientific Name | Common Name |
|---|---|---|
| TREES | Abies amablis | Silver fir |
| | Abies concolor | White fir |
| | Picea engelmannii | Engelmann spruce |
| | Pinus contorta | Lodgepole pine |
| | Pinus monticola | Western white pine |
| | Pinus ponderosa | Ponderosa pine |
| | Pseudotsuga menziesii | Douglas fir |
| | Tsuga mertensiana | mountain hemlock |
| SHRUBS | Amelanchier alnifolia | Western serviceberry |
| | Arctostaphylos nevadensis | Pinemat manzanita |
| | Arctostaphylos patula | Green-leaf manzanita |
| | Castanopsis chrysophylla | Golden chinquapin |
| | Ceanothus prostratus | Squaw carpet |
| | Ceanothus velutinus | Snowbrush |
| | Chimaphila umbellata | Prince's-pine |
| | Chrysothamnus viscidiflorus | Green rabbit-brush |
| | Cornus canadensis | Bunchberry |
| | Holodiscus dumosus | Gland ocean-spray |
| | Lonicera involucrata | Bearberry honeysuckle |
| | Pachistima myrsinites | myrtle pachistima |
| | Purshia tridentata | Bitterbrush |
| | Ribes cereum | Squaw currant |
| | Rosa woodsii | Pearhip rose |
| | Spirea betulifolia | Shiny-leaf spirea |
| | Symphoricarpos spp. | Snowberry species |
| | Vaccinium membranaceum | Big huckleberry |
| | Vaccinium scoparium | Grouse huckleberry |
| GRASSES | Calamagrostis rubescens | Pinegrass |
| | Elymus canadensis | Canada wildrye |
| | Festuca occidentalis | Western fescue |
| | Melica subulata | Alaska oniongrass |
| | Sitanion hystrix | Bottlebrush squirreltail |
| | Stipa occidentalis | Western needlegrass |
| | Trisetum canescens | Tall trisetum |
| SEDGES and RUSHES | Carex nigricans | Black alpine sedge |
| | Carex pensylvanica | Long stolon sedge |
| | Carex rostrata | Beaked sedge |
| | Juncus balticus | Baltic rush |

| | | |
|---|---|---|
| **FORBS** | Achillea millefolium | Western yarrow |
| | Aconitum columbianum | Columbian monkshood |
| | Agoseris glauca | Pale agoseris |
| | Anemone lyallii | Lyall's anemone |
| | Antennaria microphylla | Rosy pussy-toes |
| | Aquilegia formosa | Red columbine |
| | Calochortus eurycarpus | Wide-fruit mariposa |
| | Castelleja miniata | Scarlet paintbrush |
| | Cirsium spp. | Thistle species |
| | Clintonia uniflora | Queen's cup |
| | Epilobium angustifolium | Fireweed |
| | Epilobium glandulosum | Common willow-herb |
| | Equisetum palustre | Marsh horsetail |
| | Fragaria virginiana | Broadpetal strawberry |
| | Galium spp. | Bedstraw species |
| | Geum aleppicum | Yellow avens |
| | Habenaria sparsiflora | Canyon bog-orchid |
| | Hieraceum albiflorum | White-flowered hawkweed |
| | Hypericum formosum | Western St. Jon's-wort |
| | Linnaea borealis | Western twinflower |
| | Lupinus lepidus | Prairie lupine |
| | Lupinus polyphyllus | Bigleaf lupine |
| | Mimulus guttatus | Yellow monkey-flower |
| | Mimulus primuloides | Primrose monkey-flower |
| | Pedicularis racemosa | Leafy lousewort |
| | Penstemmon cinicola | Ash penstemmon |
| | Polygonum bistortoides | American bistort |
| | Potentialla rivalis | Brook cinquefoil |
| | Prunella vulgaris | Self-heal |
| | Pterospora andromedea | Woodland pinedrops |
| | Pyrola secunda | Sidebells pyrola |
| | Rununculus spp. | Buttercup species |
| | Sidalcea spp. | Checker-mallow species |
| | Sisyrinchium spp. | Sisrinchium species |
| | Smilacina stellata | Starry solomon-plume |
| | Spraguea umbellata | Umbellate pussypaws |
| | Trifolium longipes | Long-stalked clover |
| | Veratrum californicum | California false hellebore |
| | Veronica americana | American brooktime |
| | Vicia americana | American vetch |
| | Viola nuttallii | Nuttall violet |

Table 2. Average temperature and precipitation at Wickiup Dam. Based on average of years 1944 to 1978.

| | Temperature | | Precipitation | |
|---|---|---|---|---|
| | F° | C° | Inches | mm |
| Average annual | 42.7 | 5.9 | 20.49 | 5204 |
| Average January | 25.8 | -3.4 | ------------- | |
| Average July | 60.9 | 15.9 | ------------- | |
| Average June-August | ------------ | | 0.77 | 196 |

TIMBER RESOURCES: Cultus River RNA

The existing timber resources are best described as a composite of "stands." The 1978 stand mapping and classification project included all Proposed Natural Area's and is used as the basic description of Timber Resources.

# ESTABLISHMENT REPORT
# FOR THE PROPOSED
# KATSUK BUTTE RESEARCH NATURAL AREA
# DESCHUTES NATIONAL FOREST

## Principal Distinguishing Features

Katsuk Butte Research Natural Area (RNA) involves approximately 950 acres (385 hectares) of subalpine terrain 3 miles (4.8 kilometers) east of the crest of the Oregon Cascades (Figure 3). The RNA is located 5 miles (8 km.) south of the Three Sisters peaks. It is bounded on the north by Devils Lake and the Cascade Lakes Highway, and on the east by Sparks Lake. This is an area formed by numerous lava flows, pumice, ash, and cinder deposits. Glaciation has left many shallow lakes in broad valleys. The majority of the proposed RNA is occupied by two cinder cones, Talapus Butte and Katsuk Butte. Both cones are over 6000 feet (1830 meters) in elevation at their summits. The buttes are steep sided and nearly symmetrical with central craters and slopes composed of cinders, pumice, and ash. Included within the RNA are the two cinder cones, three craters, lava flows, and a small pond with sphagnum moss (Sphagnum species) on its shores. The forest is dominated by mountain hemlock (Tsuga mertensiana)[1] throughout most of the RNA. Lodgepole pine (Pinus contorta) dominates in small areas on the rims and in the craters of the cones, and on the south side of Katsuk Butte. Subalpine fir (Abies lasiocarpa) is common in every part of the RNA. Other coniferous species are present in minor amounts. Natural regeneration of tree species is sparse. The herbaceous layer is simple, and almost totally lacking as the canopy closes. Soils are pumiceous loamy sands, often very shallow. Slopes range from near zero in the craters to 80 percent on the sides of the cinder cones. Elevational limits are 5280 feet (1610 m.) to 6165 feet (1880 m.). The area is summer range for mule deer.

## Justification

Katsuk Butte RNA fills the need for a high elevation, undisturbed, entirely forested cinder cone. This is a high priority need identified by the Research Natural Area Needs Workshop[2] in 1973. Katsuk Butte RNA is occupied by two

[1] Common and scientific nomenclature follows Hitchcock, Leo C. and Arthur Cronquist, Flora of the Pacific Northwest, University of Washington Press, Seattle, Washington, 1973, 730 pages, illustrated.

[2] Dyrness, C.T., Jerry F. Franklin, Chris Maser, Stanton A. Cook, James D. Hall and Glenda Faxon, Research Natural Area Needs in the Pacific Northwest, Pacific Northwest Forest and Range Experiment Station, USDA Forest Service, Portland, Oregon, 1975, 231 pages.

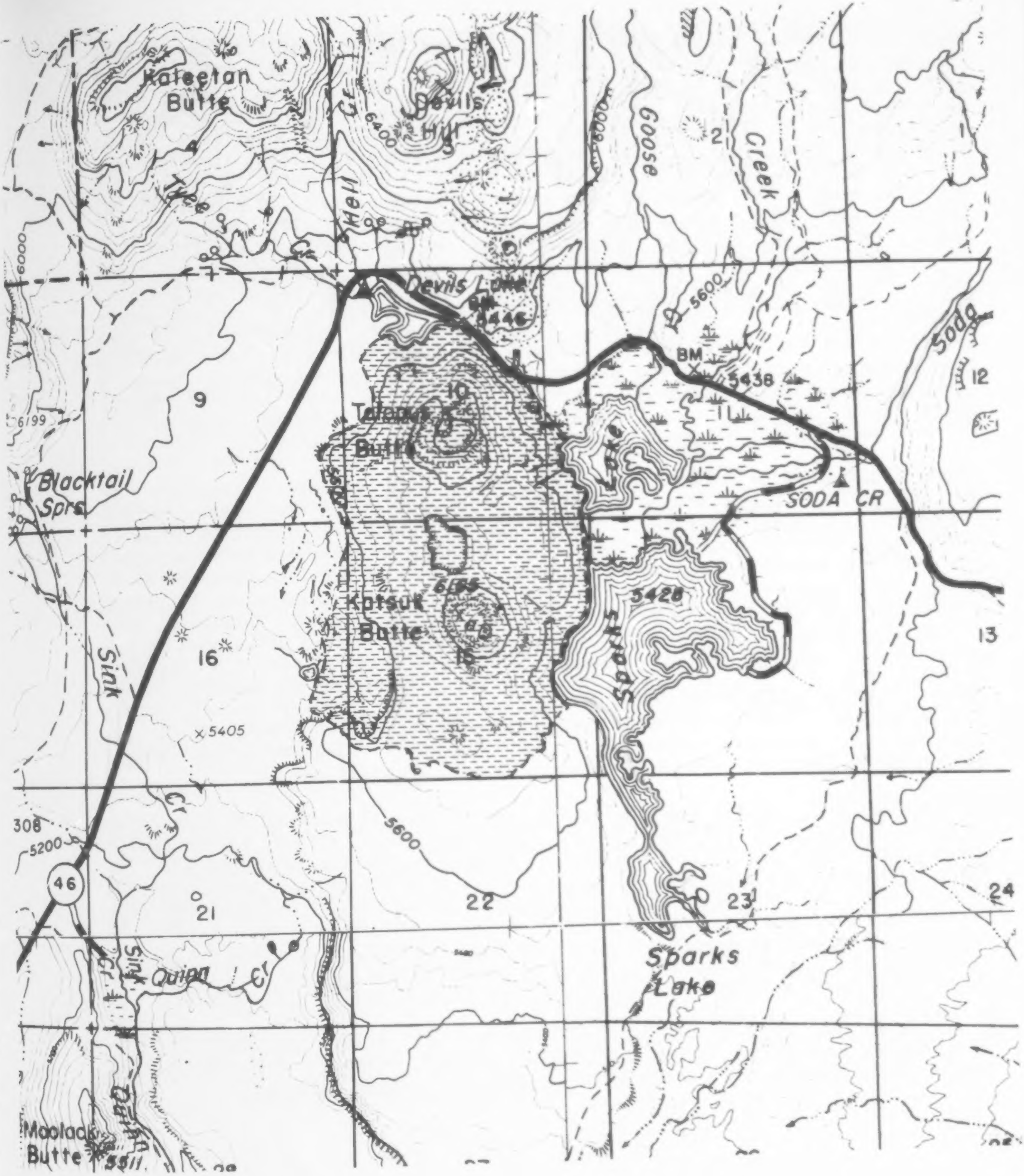

Kaleetan Butte
Devils Hill
6400
Goose
Creek
2
3
Tyee
Cr
Hell
Cr
6000
7
Devils Lake
BM 5446
5600
Soda
12
BM
5438
9
10
Talapus Butte
6199
Blacktail Sprs
Lava
SODA CR
Katsuk Butte
6155
5428
Sparks
13
16
Sink
5405
Cr
308
5200
46
5600
21
22
23
24
Sparks Lake
Quinn
Cr
Sink
Cr
Moolack Butte
5511

**Figure XXVI**

large cinder cones, Talapus Butte to the north and Katsuk Butte to the south. The base of the cones are at an average elevation of 5600 feet (1708 m.). The summit of Talapus Butte is 6158 feet (1878 m.) in elevation. The highest point on Katsuk Butte is at 6165 feet (1880 m.). The cinder cones occupy an approximate total area of 575 acres (773 ha.). They are pre-Mazama, more than 10,000 years old. The sides of the cones have an average 50 percent slope and are entirely forested. Each of the buttes has a central crater about 2 acres (.8 ha.) in size. The walls of the craters are steep, up to 80 percent slope. Talapus Butte's crater has several rock cliffs and is about 200 feet (61 m.) deep. Katsuk Butte's crater is smooth walled and has a depth of about 150 feet (46 m.). The floor and walls of both are covered with cinders, pumice, and ash. The vegetation of the craters is dominated by sedges and grasses. Lodgepole pine is the only tree species which can survive in the extreme soils and microclimate of the craters. A sharp contrast in vegetation can be seen inboth craters result of lingering snowpack on the eastern half. An imaginary line running northeast to the southwest would divide the vegetation. Brewer's sedge (*Carex breweri*) dominates the ground layer in the east half of Hall's sedge (*Carex halliana*) the west half of the craters. Lodgepole pine is more abundant and somewhat larger on the northwest side of the craters.

Climax lodgepole pine communities occur on sites with extremely immature or shallow soils. These stands are found on the rims and in the craters of the buttes, and on major lava flows. Seral lodgepole stands are present in areas of recent crown fire or soil disturbance. The mountain hemlock community occupies the remaining forested portions of the RNA. In much of this community there is very little understory. Mountain hemlock is dominant with subalpine fir (*Abies lasiocarpa*) the next most common tree species. Lodgepole pine, whitebark pine (*Pinus albicaulis*), ponderosa pine (*Pinus ponderosa*), western white pine (*Pinus monticola*), white fir (*Abies concolor*)[3], and Pacific silver fir (*Abies amablis*) are present in minor amounts. The ground layer is scanty. Common species include grouse huckleberry (*Vaccinium scoparium*), sticky currant (*Ribes viscosissimum*), long-stolon sedge (*Carex pensylvanica*), smooth woodrush (*Luzula hitchcockii*), sidebells pyrola (*Pyrola secunda*), woodland bread-tongue (*Nothochelone nemorosa*) and white hawkweed (*Hieracium albiflorum*).

The portion of the RNA surrounding the cinder cones is composed of lava flows overlain with cinders, pumice, and ash. These lava flows, as well as the cinder cones, originate from a buried fissure which runs the length of the RNA from north to south. The third crater within the RNA is a pit crater located midway between the two buttes. This is believed to be an area in which molten rock drained out from under a hardened crust, leaving a depression. Steep walls in several parts of the crater and a central domelike hill of lava are indicators of this origin. Many minor and a few major rock outcroppings within the Katsuk Butte RNA are evidence of the lava flows. The largest exposed lava flow is

[3] Grand fir (*Abies grandis*) and white fir (*Abies concolor*) form a continuously varying biological complex in eastern Oregon. Throughout this report the complex will be referred to as white fir (*Abies concolor*).

located southwest of Katsuk Butte. The exposed portion is approximately 1/4 mile (.4 km.) long, 1/8 mile (.2 km.) wide and 100 to 200 feet (31 to 61 m.) thick. The entire RNA has been covered by ash and pumice from several sources. Talapus Butte and Katsuk Butte could have contributed to the deposits over 10,000 years ago. Mazama ash from 7000 years ago is known to cover the area. Additionally, which runs through the RNA, just north of the northern boundary. The lava outcrops, cindered slopes, and pumice areas all add to the diversity of the proposed RNA.

A small pond less than 1 acre (.3 ha.) in size adds another landform and community type to the RNA. The pond supports several aquatic plant species including bogbean (Menyanthes trifoliata), Indian pond lily (*Nuphar polysepalum*), and broad-leaved pondweed (*Potamogeton natans*). The area around the pond averaging 6 feet (1.8 m.) wide is nonforested. Sphagnum moss and black alpine sedge (*Carex nigricans*) dominate the shore vegetation.

Katsuk Butte RNA is surrounded by popular recreational land. The heavily used Cascade Lakes Highway runs within a few feet to 1 mile (1.6 km.) of the boundaries of the RNA. Both Devils Lake and Sparks Lake, bounding the RNA on the north and east, attract outdoor enthusiasts.

Many hiking trails originate from the Cascade Lakes Highway. At this time the only disturbance to the RNA is the maintained trail around the south end of Devils Lake forming the northern boundary, and possible grazing by domestic livestock near the pond.

The Katsuk Butte Research Natural Area would provide an outstanding geological study area. Research possibilities related to vulcanism are abundant. The variety of surface soils from cinders and pumice to sandy loam to exposed lava represented in the RNA suggests soil and plant community studies. The craters and rims of the buttes present opportunities for research on extreme soils and in severe microhabitats. The area would provide substantial acreage of subalpine mountain hemlock community.

## Location

The proposed Katsuk Butte RNA occupies approximately 950 acres (385 ha.) in the Deschutes National Forest, Bend Ranger District. It is located at North Latitude 44°02' and West Longitude 121°44'. The tract is in Deschutes County, 21 air miles (33.6 km.) west of Bend, Oregon. The RNA involves portions of secs. 9, 10, 15, and 16, T. 18 S., R. 8 E., W.M.

To reach the RNA follow signs west out of Bend, Oregon towards Century Drive and Bachelor Butte. Six miles (9.6 km.) west of Bend, Century Drive becomes the Cascade Lakes Highway. In 22 additional miles (35.4 km.) turn left into Devils Lake Campground and park. The trail around the south end of Devils Lake is accessible from the parking lot. Follow the trail to the northern boundary of the RNA in about one-fourth mile (.4 km.). All access to the interior is by foot. The majority of the terrain is quite steep.

## Community Types

Plant communities within the RNA reflect changes in the volcanic soils, slope aspect, and fire history. Surface soils include saturated peaty-loam around the pond to the sandy loams of the mountain hemlock community, exposed lava flows supporting lodgepole pine and shrub communities, and cinder and pumice dominated by lodgepole, sedges, or forbs. Mountain hemlock dominates throughout most of the RNA.

Lodgepole pine is prevalent in areas of recent fire, immature soils, and steep south slopes. Subalpine fir and western white pine of all ages are common. Ponderosa pine and whitebark pine are present on rocky summits, mainly as old growth. Mountain hemlock regeneration is on all sites except some dominated by lodgepole pine. Mountain hemlock is the major climax species. Lodgepole pine occurs as topoclimax, fire climax, and a subordinate seral species. Ecologically, the communities encountered in the Katsuk Butte RNA best fit into the *Tsuga mertensiana* Zone[4] of the crest of the Oregon Cascades. This zone is characterized by old growth mountain hemlock forests with seral lodgepole pine and subalpine fir. Understories are often depauperate or dominated by grouseberry.

Four plant communities have been identified in the RNA. Two may be correlated to Volland's[5] plant communities as follows:

| Unit | Plant Community | Location | Acreage |
|---|---|---|---|
| 1 | Lodgepole pine/grouse huckleberry CL-S4-12 | Rims, craters, larger lava flows, south slope Katsuk Butte, old burns | 75<br>(30 ha.) |
| 2 | Mountain hemlock/grouse huckleberry CM-S1-11 | Remaining forested area | 875<br>(354 ha.) |

The largest representation of the lodgepole/grouse huckleberry community is found on the south slope of Katsuk Butte. The butte has an average slope of 40 percent within this community. Lodgepole pine is the dominant tree species and is presently primarily as old growth. This situation appears to be a result of the coarse soil, dry southern exposure and frequent fires. Subalpine fir and mountain hemlock are seen as all ages. The shrub layer is composed of squaw currant (*Ribes cereum*), sticky currant, and green-leaf manzanita (*Arctostaphylos patula*). Rabbitbrush goldenweed (*Haplopappus bloomeri*), silvery lupine (*Lupinus argenteus*), American vetch (*Vicia americana*), pearly-everlasting (Anaphalis *margaritacea*), western needlegrass (*Stipa occidentalis*), and bottlebrush squirreltail (*Sitanion hystrix*) are common in the ground layer. Total tree basal area approximates 150 to 200 ft$^2$/acre (35 to 47 m$^2$/ha.) with lodgepole pine averaging 100 ft.$^2$ (23 m.$^2$/ha.). Stands are pole-sized. Regeneration is dominated by mountain hemlock and subalpine fir. A variation of this community is observed on the lava flow to the southwest of Katsuk Butte. Vegetation is much the same as just described but is interspersed with areas much simpler botanically. In these small patches lodgepole clearly dominates the overstory. Both sticky currant and squaw currant are found in the scanty shrub layer. Silvery lupine is the sole herb. These areas appear to be immature, possibly recently burned and slow to recover. In other parts of the RNA the incidence of lodgepole may increase as a result of shallow undeveloped soils. These areas are found on the rims of both buttes and on pumice and cinders not included in the craters. The rim of Katsuk Butte exhibits lodgepole pine with dominantly lupine ground layers. Generally, the rims support a variety of tree species and lodgepole pine may dominate small areas. Whitebark pine and ponderosa pine are present in small amounts. Sedges, grasses, pinemat manzanita (*Arctostaphylos nevadensis*) and gland ocean-spray (*Holodiscus dumosus*) dominate the understory. Other common species on the rims include rushes (*Juncus* species), rabbitbrush goldenweed, and greenleaf manzanita. The three craters within the RNA produce a topoclimax of lodgepole pine as a result of the coarse, immature soils and extreme cold microclimates. The pit crater in the center of the RNA is about 100 feet (31 m.) deep. The floor of the crater is covered with coarse pumice and cinders. All ages of lodgepole are present, averaging 30 feet (9 m.) in height and 5 inches (13 cm.) d.b.h.[6] Rare mountain hemlock and subalpine fir are found as regeneration. There is no shrub layer. Parry's rush (*Juncus parryi*) and Brewer's sedge dominate the ground layer. The craters of Talapus and Katsuk Buttes are very similar to each other. They are quite deep and steep sides so that the southeast halves are shaded much of the time. This results in that half of the craters having a noticeably more severe microclimate. There is a clear division of plant species between the east and west portions of the craters. Brewer's sedge dominates the eastern half and Hall's sedge the west half of each crater. Fescue (*Festuca* species) and pussy-toes (*Antennaria* species) individuals are in greater numbers on the east side. Few species of trees are found in the craters. Lodgepole is clearly dominant, occurring as scattered, stunted individuals. Stems are noticeably smaller and fewer in the eastern halves of the craters.

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[4] Franklin, Jerry F. and C. T. Dyrness, *Natural Vegetation of Oregon and Washington*, U.S. Government Printing Office, Washington, D.C., 1973, 417 pages, illustrated.

[5] Volland, Leonard A., *Plant Associations of the Central Oregon Pumice Zone*, USDA Forest Service Pacific Northwest Region, Portland, Oregon, September 1982. R6-Ecol-104-1982. 122 p.

The mountain hemlock/grouse huckleberry community occupies the remaining forested portion of the RNA. There is considerable variety within this plant community. Nearly pure stands of mountain hemlock are seen on the north slope of Talapus Butte. Soils are shallow and rocky. Slope averages 50 percent. Basal areas average: 240 ft.$^2$/acre (56 m.$^2$/ha.) for mountain hemlock, 20

[6] d.b.h. is an abbreviation of diameter-breast-height and is the diameter of the tree stem measured 54 inches (137 cm.) above ground level.

ft.$^2$/acre (7 m.$^2$/ha.) for both lodgepole pine and subalpine fir. Stems average 70 feet (21 m.) in height and 8 inches (20 cm.) in diameter for mountain hemlock, 80 feet (24 m.) and 10 inches (25 cm.) for lodgepole pine and 60 feet (18 m.) and 8 inches (20 cm.) d.b.h. for subalpine fir. Regeneration is dominated by hemlock and subalpine fir. A few small white fir and western white pine are present. Snow pressure has produced stems rather uniformly curved (pistol butt) at the bases. The snow depth in the RNA as reflected by the lichens on the tree trunks averages 15 feet. The understory in this community is depauperate, often dominated by grouse huckleberry. Areas occur in which there is no understory. As crown cover decreases understory increases. Some herbs found include woodland beard-tongue, sidebells pyrola (*Pyrola secunda*), western rattlesnake-plantain (*Goodyera oblongifolia*) and smooth woodrush (*Luzula hitchcockii*). The largest hemlock in the RNA reach 40 inches (102 cm.) in diameter and 120 feet (37 m.) in height. Subalpine fir may be as large as 27 inches (69 cm.) d.b.h. and 120 feet (37 m.) tall. On coarser pumice soils stems are smaller than on the north side of Talapus Butte. Basal areas decrease to about 130 ft.$^2$/acre (30 m$^2$/ha.) for hemlock, 40 ft.$^2$/acre (9 m.$^2$/ha.) for lodgepole, and less than 20 ft.$^2$/acre (5 m.$^2$/ha.) for subalpine fir. Common but scant understory species are sticky currant and sidebells pyrola. On the east slopes of Talapus Butte Pacific silver fir and white fir are common but still subordinate regeneration. On rocky outcrops within the hemlock community additional shrubs are found. Under the tree canopy bearberry honeysuckle (*Lonicera involucrata*), big huckleberry (*Vaccinium membranaceum*), and many lichens are seen. On cindered slopes on the north side of Talapus Butte trees are few and stunted. Hemlock dominates with several old whitebark pine and ponderosa pine. The dominant shrub is pinemat manzanita. Dominant herbs are Davidson's penstemmon (*Penstemon davidsonii*) and creamy sedum (*Sedum oregonese*).

Other common species are gland ocean-spray and Newberry's fleeceflower (*Polygonum newberryi*). On lava outcrops within the hemlock community some new species are found. These include the rock-brake fern (*Cryptogramma crispa*), lace lip-fern (*Cheilanthes gracillima*), myrtle pachistima (*Pachistima myrsinites*) and mountain juniper (*Juniperus communis*). Large old ponderosa pine about 30 inches (76 cm.) in diameter and 60 feet (18 m.) tall are often found along the edges of the lava flows.

The other two plant communities found in the Katsuk Butte RNA are associated with the small pond on the northeast boundary of the RNA. They are both nonforested communities which have not been described by Volland. The third plant community is the pond. The pond is less than an acre (.4 ha.) in size and is somewhat stagnant. Substantial amounts of bogbean, Indian pond lily and broad-leaved pondweed are present in the pond. The fourth plant community is similar to the *Carex-Sphagnum* community described by Campbell.[7] This is a bog community and is found surrounding the pond. Sphagnum moss dominates the ground layer on the northwest edge of the pond. Black alpine sedge is the most common

[7] Campbell, Alcetta Gilbert, *Vegetative Ecology of Hunt's Cove, Mt. Jefferson, Oregon*, 1973, 89 pages, illustrated. (Unpublished M.S. thesis on file at OSU, Corvallis, Oregon.)

species on the rest of the shore. Other common species include western bog blueberry (*Vaccinium occidentale*), western swamp laurel (*Kalmia occidentalis*), purple cinquefoil (*Potentilla palustris*), angelica (*Angelica species*), and slimstem reedgrass (*Calamagrostis neglecta*). This community averages 6 feet (2 m.) wide and occupies an approximate total area of 1/10 acre (.04 ha.). Hemlock and subalpine fir regeneration is encroaching from the surrounding mountain hemlock community.

Katsuk Butte Research Natural Area falls within Kuchler's[8]. It is also included in the SAF Cover Type[9].

## *Protection and Management*

See direction in Forest Plan for Research Natural Areas.

[8] Kuchler, A.W., *Potential Natural Vegetation of the Conterminous United States*, American Geographical Society, Special Publication Number 36, illustrated.

[9] Society of American Foresters, *Forest Cover Types of North America, Exclusive of Mexico*, Society of American Foresters, Washington, D.C., 1954, 67 pages, illustrated.

Table 1. Partial list of vascular plants of Katsuk Butte Research Natural Area

| | Scientific Name | Common Name |
|---|---|---|
| TREES | Abies amablis | Pacific silver fir |
| | Abies concolor | white fir |
| | Abies lasiocarpa | subalpine fir |
| | Pinus albicaulis | white bark pine |
| | Pinus contorta | lodgepole pine |
| | Pinus monticola | western white pine |
| | Pinus ponderosa | ponderosa pine |
| | Tsuga mertensiana | mountain hemlock |
| SHRUBS | Arctostaphylos nevadensis | pinemat manzanita |
| | Arctostaphylos patula | green-leaf manzanita |
| | Chimaphila umbellata | prince's-pine |
| | Holodiscus dumosus | gland ocean-spray |
| | Kalmia occidentalis | western swamp laurel |
| | Lonicera involucrata | bearberry honeysuckle |
| | Pachistima myrsinites | mountain lover |
| | Ribes cereum | squaw currant |
| | Ribes viscosissimum | sticky currant |
| | Vaccinium membranaceum | big huckleberry |
| | Vaccinium occidentale | western bog blueberry |
| | Vaccinium scoparium | grouseberry |
| SEDGES and RUSHES | Carex breweri | Brewer's sedge |
| | Carex halliana | Hall's sedge |
| | Carex nigricans | black alpine sedge |
| | Carex pensylvanica | long-stolon sedge |
| | Juncus parryi | Parry's rush |
| GRASSES | Calamagrostis neglecta | slimstem reedgrass |
| | Calamagrostis rubescens | pinegrass |
| | Danthonia intermedia | timber oatgrass |
| | Elymus cinereus | giant wildrye |
| | Fetuca species | fescue species |
| | Sitanion hystrix | bottlebrush squirreltail |
| | Stipa occidentalis | western needlegrass |
| FORBS | Anaphalis margaritacea | pearly-everlasting |
| | Anemone drummondii | Drummond's anemone |
| | Angelica species | angelica species |
| | Antennaria microphylla | rosy pussy-toes |
| | Cheilanthes gracillima | lace lip-fern |
| | Circium species | thistle species |
| | Cryptogramma crispa | rock-brake |
| | Eriogonum species | buckwheat species |
| | Goodyera oblongifolia | western rattlesnake-plantain |

| | | |
|---|---|---|
| FORBS (Cont'd) | Haplopappus bloomeri | rabbitbrush goldenweed |
| | Hieraceum albiflorum | white hawkweed |
| | Hypopitys monotropa | fringed pinesap |
| | Lupinus wyethii | Wyeth's lupine |
| | Luzula hitchcockii | smooth woodrush |
| | Menyanthes trifoliata | bogbean |
| | Nothochelone nemorosa | woodland beard-tongue |
| | Nuphar polysepalum | Indian pond lily |
| | Penstemon cinicola | ash penstemmon |
| | Penstemon davidsonii | Davidson's penstemon |
| | Polygonum newberryi | Newberry's fleeceflower |
| | Potamogeton natans | broad-leaved pondweed |
| | Potentilla palustris | purple cinquefoil |
| | Pyrola picta | white vein pyrola |
| | Pyrola secunda | sidebells pyrola |
| | Sedum oregonense | creamy sedum |
| | Spraguea umbellata | umbellate pussypaws |
| | Vicia americana | American vetch |

## TIMBER RESOURCES: Katsuk Butte RNA

The existing timber resources are best described as a composite of "stands." The 1978 stand mapping and classification project included all Proposed Research Natural Area's and is used as a basic description of Timber Resources.

## STANDS WITHIN RESEARCH NATURAL AREA - DESCRIPTION

| | | Overstory | | | | | Understory | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Stand | Acres/% Within RNA | Species | Maturity | Size | Volume | Stock | Species | Maturity | Size | Volume | Stock |
| 28 | 60/6.0 | Hemlock | Mature | Large Sawlog | 3<br>210 M | L | Hemlock<br>Lodgepole | Midstory<br>Mature | Small Sawlog | 7 | E |
| | | | | | | | Lodgepole<br>Hemlock | Understory<br>Immature | Seedl. & Sapl. | - | LE |
| 29 | 12/1.2 | Water | | | - | | | | | | |
| 30 | 310/30/9 | Hemlock | Mature | Large Sawlogs | 7<br>2325 M | L | Hemlock | Midstory<br>Mature | Small Sawlogs | 7 | E |
| | | | | | | | Hemlock | Understory<br>Immature | Seedl. & Sapl. | - | L |
| 31 | 6/.6 | Not Capable | | | | | | | | | |
| 32 | 75/75 | Hemlock | Mature | Large Sawlogs | 7<br>562 M | L | Hemlock<br>Lodgepole | Midstory<br>Mature | Small Sawlog | 7 | E |
| | | | | | | | Hemlock<br>Lodgepole | Understory<br>Immature | Seedl. & Sapl. | - | EL |
| 34 | 40/4.0 | Lodgepole | Mature | Small Sawlogs | 7<br>300 M | E | Lodgepole | Immature | Seedl. & Sapl., Poles | - | L |
| 35 | 22/2.2 | | Not Capable | | - | | | Midstory | | | |
| 36 | 18/1.8 | Lodgepole | Mature | Small Sawlog | 7<br>135 M | E | Mixed, All Other Lodgepole | Immature | Seedl. & Sapl. | - | L |
| 60 | 11/1.1 | Water | | | | | | | | | |

Volume Codes

| | |
|---|---|
| 1=0 to 2M Bd. Ft. | 1 |
| 3=2M to 5M Per Acre | 3.5 |
| 7=5M to 10M | 7.5 |
| 15=10M to 20M | 15 |
| 25=20M to 30M | 25 |
| 35=30M+ | 30 |

Stocking Codes

E = Excessive
S = Satisfactory
L = Low
EL = Clumpy - 50% Stocked
LE = Clumpy - 50% Stocked

## STANDS WITHIN RESEARCH NATURAL AREA - DESCRIPTION

| | | Overstory | | | | | Understory | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Stand | Acres/% Within RNA | Species | Maturity | Size | Volume | Stock | Species | Maturity | Size | Volume | Stock |
| 23 | 8/.8 | White &<br>Grand Fir | Mature | Large<br>Sawlog | 7<br>60M | | White &<br>Grand Fir | Midstory<br>Mature | Small<br>Sawlog | 7 | E |
| | | | | | | | White &<br>Grand Fir | Understory<br>Immature | Seedl.<br>& Sapl. | - | E |
| 82 | 28/2.8 | | Water/Meadow | | - | | | | | | |
| 83 | 28/2.8 | Lodgepole | Mature | Small<br>Sawlogs | 3<br>98M | L | Lodgepole | Immature | Seedl.<br>& Sapl. | - | L |
| 84 | 53/5.3 | Shasta &<br>Noble Fir,<br>White &<br>Grand Fir<br>Hemlock,<br>Ponderosa | Mature | Large<br>& Small<br>Sawlogs | 7<br>397M | EL | Shasta &<br>Noble Fir,<br>White &<br>Grand Fir<br>Hemlock,<br>Ponderosa | Immature | Poles,<br>Seedl.<br>& Sapl.<br>Small<br>Sawlogs | 3 | LE |
| 86 | 5/.5 | Not Capable/Meadow | | | | | | | | | |
| 87 | 110/11.0 | Hemlock | Mature | Large<br>Sawlogs | 3<br>335M | L | Hemlock<br>Lodgepole | Midstory<br>Mature | Small<br>Sawlogs | 7 | E |
| | | | | | | | Hemlock<br>Lodgepole | Understory<br>Immature | Seedl.<br>& Sapl. | - | EL |
| 88 | 14/1.4 | | Not Capable/Meadow | | | - | | Midstory | | | |
| 89 | 42/4.2 | Englemann<br>Spruce<br>Lodgepole | Mature | Small<br>Sawlog | 7<br>315M | E | Englemann<br>Spruce<br>Lodgepole | Immature | Poles<br>Seedl.<br>& Sapl. | - | E |

Volume Codes

1=0 to 2M Bd. Ft.
3=2M to 5M Per Acre
7=5M to 10M
15=10M to 20M
25=20M to 30M
35=30M+

Stocking Codes

E = Excessive
S = Satisfactory
L = Low
EL = Clumpy - 50% Stocked
LE = Clumpy - 50% Stocked

## STANDS WITHIN RESEARCH NATURAL AREA - DESCRIPTION

| | | Overstory | | | | | Understory | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Stand | Acres/% Within RNA | Species | Maturity | Size | Volume | Stock | Species | Maturity | Size | Volume | Stock |
| 91 | 24/24 | Englemann Spruce | Mature | Small Sawlog | 7<br>180M | | Englemann Spruce, Lodgepole, White & Grand Fir | Midstory<br>Immature | Seedl. & Sapl. | - | L |
| 92 | 11/1.1 | Not Capable/Meadow | | | - | | | | | | |
| 93 | 62/6.2 | Englemann Spruce | Mature | Small Sawlogs | 7<br>464M | E | Englemann Spruce, White & Grand Fir, Lodgepole | Immature | Seedl. & Sapl. | - | L |
| 94 | 65/6.5 | Lodgepole | Mature | Small Sawlogs | 7<br>487M | E | White & Grand Fir | Immature | Seedl. & Sapl. | - | L |

Midstory

21 Timber Stands
Approximately 1,004 Acres
Approximatley 5.919 Million Board Feet (Mature)

Volume Codes

1=0 to 2M Bd. Ft.
3=2M to 5M Per Acre
7=5M to 10M
15=10M to 20M
25=20M to 30M
35=30M+

Stocking Codes

E = Excessive
S = Satisfactory
L = Low
EL = Clumpy - 50% Stocked
LE = Clumpy - 50% Stocked

# ESTABLISHMENT REPORT
# FOR THE PROPOSED
# MOKST BUTTE RESEARCH NATURAL AREA
# DESCHUTES NATIONAL FOREST

## Principal Distinguishing Features

Mokst Butte Research Natural Area (RNA) occupies approximately 1,250 acres (506 hectares) in the central Oregon pumice plateau. This is an area of numerous small cinder cones, extensive pumice deposits, and young lava flows (Figure 4). The geology of the proposed RNA is perhaps its most outstanding feature. Three geologic time periods are represented in the RNA. The oldest geologic feature is the unnamed cinder cone on the south boundary. The cinder cone is pre-Mazaman, more than 6,600 years old. It is about 400 feet (122 meters) high and occupies about 90 acres (37 ha.). The cone and the area immediately to its west are covered with about 2 feet (.6 m.) of Mazama ash from about 6,600 years ago. The entire RNA was covered with Mazama ash but most has since been buried by more recent local ash and lava eruptions. Two other smaller areas within the RNA also exhibit uncovered Mazama ash.

Mokst Butte originated about 6,000 years ago and drastically altered the surrounding landscape. During the first eruption the cone of Mokst Butte was formed and ash was carried by the wind to the northeast. The cindery ash was deposited about 2 inches (5 centimeters) deep. To the northwest of Mokst Butte a cinder and spatter rampart formed, aligned along a fissure. The main Mokst Butte lava flow also occurred at this time. It covers more than half the proposed RNA. The second eruption built the cone higher. Ash was again blown to the northeast and deposited on the earlier lava flow. A second, smaller eruption of lava also happened at this time. It is located south and east of Mokst Butte and is free of ash or cinders. It is darker in color and has noticeably less vegetation than the abutting older flow. Today Mokst Butte is an undisturbed, forested cinder cone. The cone rises about 450 feet (137 m.) above the surrounding terrain to an elevation of 6162 feet (1879 m.) at the summit. Prevailing southwesterly winds at the time of formation have resulted in a semi-circular shape to the butte.

[1] Common and scientific nomenclature follows Hitchcock, Leo C. and Cronquist, Arthur, Flora of the Pacific Northwest, University of Washington Press, Seattle, Washington, 1973, 730 pages, illustrated.

[2] White fir (*Abies concolor*) and grand fir (*Abies grandis*) form a continously varying biological complex in central Oregon. Throughout this paper the complex will be referred to as white fir.

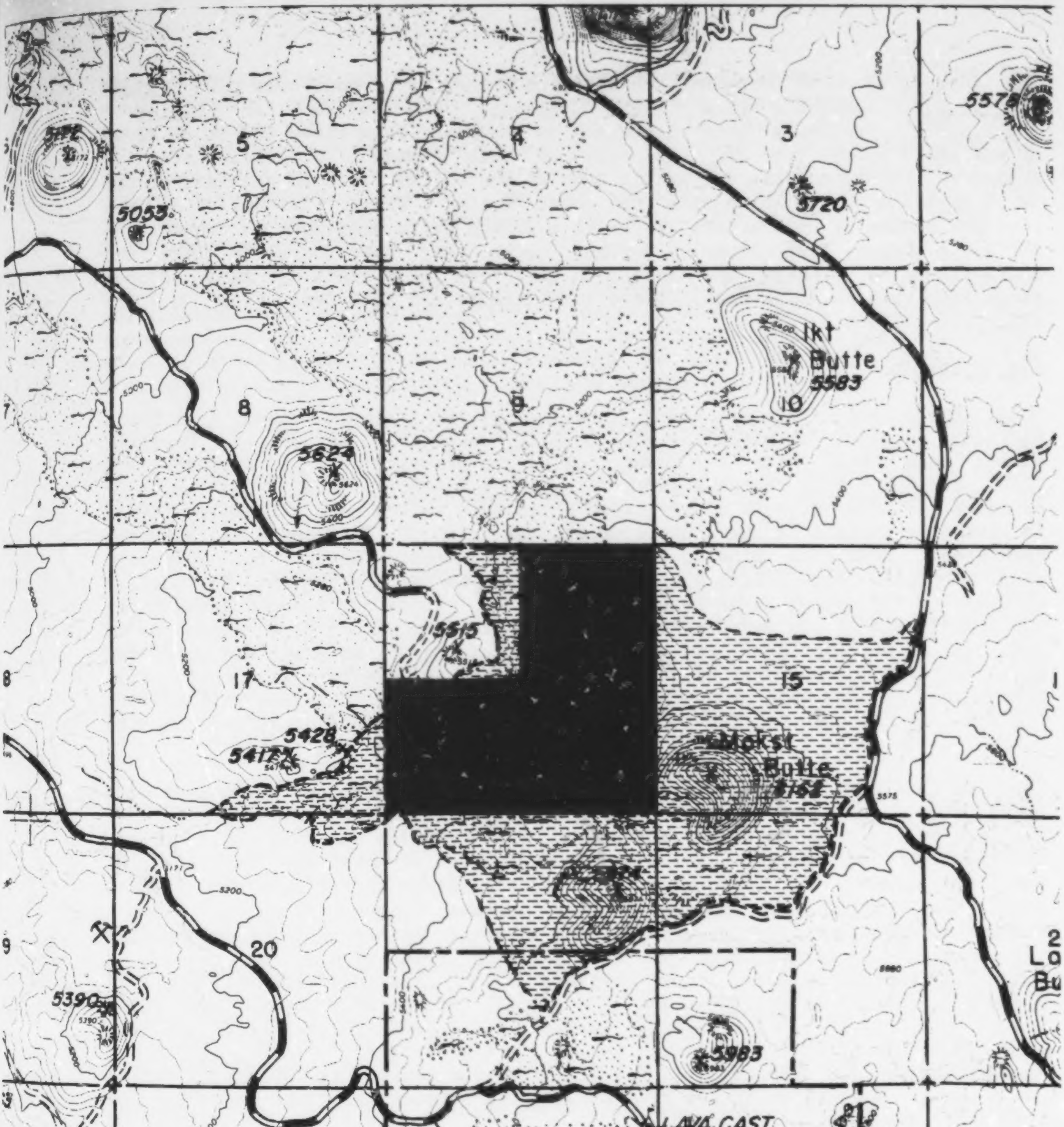

Figure XXVII

The forests of Mokst Butte RNA are composed primarily of ponderosa pine (*Pinus ponderosa*)[1], lodgepole pine (*Pinus contorta*) and white fir (*Abies concolor*)[2]. Ponderosa pine dominates on the older lava flow, the south slope of the small cinder cone and the rims of both cones. Lodgepole pine is scattered throughout the RNA and is most common on the flats to the east of the small cone and on the north side of Mokst Butte. White fir dominates the northern slopes of both cones. There is a strong shrub component throughout the RNA and a simple forb layer. Surface soils vary from basaltic lava and coarse-textured cinders and scoria to pumiceous loamy sands and sand. Slopes range from zero to 80 percent. Elevational limits are 5240 feet (1598 m.) to 6162 feet (1879 m.).

## Justification

Mokst Butte RNA fills two needs identified by the Research Natural Area Needs Workshop[3] in 1973. It meets the high priority need for an entire, forested cinder cone with white fir and the medium priority need for a recent lava flow. Mokst Butte is entirely forested on its northerly slopes. The southern exposure of the butte is a very steep slope down to the cone's fissure. There is little vegetation on the south slopes. The rim of the cone is sparsely vegetated. Ponderosa pine is the dominant tree species on the rim. Lodgepole pine, whitebark pine (*Pinus albicaulis*), and white fir are present in smaller amounts. The shrub layer is well represented. White fir becomes dominant on the upper third of the north slope of Mokst Butte. Lodgepole pine dominates on the lower third. Western white pine (*Pinus monticola*) is abundant and ponderosa pine scattered on the north slope. Regeneration is predominatly white fir. Elevations on the cone range from 5600 feet (1708 m.) at the base to 6162 feet (1879 m.) at the summit. The north side has an average slope of 45 percent, the south side 80 percent. There is no sign of disturbance on the butte.

The two lava flows included in the RNA originated from fissures associated with Mokst Butte. The older lava flow covers about 650 acres (263 ha.) of the RNA. The lava is blocky and slightly weathered. The flow has numerous small valleys and ridges and many large pinnacles. A small mount of Mokst ash is found on the lava. Shrubs are the dominant form of vegetation on the lava flows, Gland ocean-spray (*Holodiscus dumosus*), squaw currant (*Ribes cereum*), pinemat manzanita (*Arctostaphylos nevadensis*) and mountain juniper (*Juniperus communis*) are common. Ponderosa pine is the dominant tree species on the lava. Lodgepole pine, whitebark pine, western white pine, and white fir are also present. Most are mature trees and are widely scattered. Stems are often broken and contorted. The younger, smaller lava flow is located south and east of Mokst Butte. The lava is darker and has sharper edges. The flow covers approximately 100 acres (41 ha.). The vegetation is primarily gland ocean-spray. Elevations of the lava flows falls between 5240 feet (1598 m.) and 5720 feet (1745 m.).

[3] Dyrness, C. T., Jerry F. Franklin, Chris Maser, Stanton A. Cook, James D. Hall and Glenda Faxon, *Research Natural Area Needs in the Pacific Northwest*, Pacific Northwest Forest and Range Experiment Station, USDA Forest Service, Portland, Oregon, 1975, 231 pages.

Many interesting geological features are present in the proposed RNA. The RNA would provide representations of pre-Mazama and post-Mazama cinder cones. Areas of Mazama ash and local Mokst ash and lava lie side by side. Lava flows with and without ash and cinders are present. A rampart, several fissures, and some small spatter cones are also included in the RNA. The Mokst Butte RNA offers many opportunities for geologic studies. Vegetation research might include plant communities and succession on lavas. The potential for white fir might interest silviculturists.

Mokst Butte is in the midst of typical commercial forest land. Nearly all of the proposed area has been selectively logged. Mokst Butte is undisturbed. Approximately 600 acres (243 ha.) of the proposed area is privately owned. About 20 acres (8 ha.) is currently included in the Lava Cast Forest. The remainder of the RNA is federally owned and managed.

Mokst Butte RNA occupies approximately 1250 acres (506 ha.) in the Deschutes National Forest, Fort Rock Ranger District. It is located at North Latitude 43°50' and West Longitude 121°15'. The tract is in Deschutes County, 13 air miles (21 kilometers) south of Bend, Oregon. The RNA includes portions of Sections 15, 16, 17, 20, and 21 of T. 20 S., R. 12 E., W.M.

The RNA may be reached from the east or west. For access from the east follow Federal Highway 97 south out of Bend, Oregon. In about 7 miles (11 km.) turn left onto Forest Road No. 1942, following signs to Lava Cast Forest. In another 8 miles (13 km.) turn right onto Forest Road No. 195 to Lava Cast Forest. Road No. 195 is the southeastern boundary of the RNA. Take the right hand fork designated No. 9720 to continue along the boundary, the east edge of the smaller lava flow and the south side of the unnamed cinder cone. For access from the west again take Federal Highway 97 south out of Bend. In 12 miles (19 km.) turn left onto Forest Road No. 195, following signs to Lava Cast Forest. In about 7 miles (11 km.) turn left onto spur road No. 9720/860. In about a mile (1.6 km.) this logging road meets the south edge of the major lava flow at the corner shared by Sections 16, 17, 20, and 21. Another alternative is to continue on No. 195 about 2-1/2 miles (4 km.) past logging spur No. 9720/860 to the south boundary of the RNA at the base of the small cinder cone.

## Community Types

Plant communities within the RNA reflect changes in the volcanic soils and changing slope aspect. The central Oregon pumice plateau is known for its forests composed primarily of lodgepole pine and ponderosa pine. Preponderance of these species are a result of the coarse-textured, immature pumice soils. The lodgepole and ponderosa pine communities are considered to be topodaphic climaxes. Tree species in order of abundance in the RNA are ponderosa pine, lodgepole pine, white fir, western white pine, and white bark pine. White fir is the climatic climax. The communities encountered in the Mokst Butte RNA best fit into the *Pinus ponderosa* and *Pinus contorta* Zones[4] of central Oregon. These zones are characterized by seral or edaphic climaxes of lodgepole and ponderosa pine. On pumice soils sclerophyllous shrubs increase in importance. Herbaceous flora is depauperate. The zones are climatically harsh with a short growing season, low summer precipitation and wide diurnal temperature fluctuations.

Five plant associations have been identified in the RNA. The first four may be correlated to Volland's[5] plant communities as follows:

| Unit | Plant Community | Location | Acreage |
|---|---|---|---|
| 1 | Lodgepole/currant-bitterbrush/needlegrass<br>CL-S2-15 | Pumice flats, east boundary of RNA | 50 acres (20 ha.) |
| 2 | Ponderosa/bitterbrush-manzanita/needlegrass<br>CP-S2-13 | North of Mokst Butte on shallow soils | 100 acres (41 ha.) |
| 3 | Ponderosa/bitterbrush-snowbrush/needlegrass<br>CP-S3-11 | Rims and south slopes of both cinder cones, top of rampart | 10 acres (4 ha.) |
| 4 | Mixed conifer/snowbrush<br>CW-S1-14 | North slopes both cinder cones, west of small cone, "island" in lava flow, northwest of Mokst Butte | 340 acres (138 ha.) |
| 5 | Lava community | Both lava flows | 750 acres (304 ha.) |

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[4] Franklin, Jerry F. and Dyrness, C. T., Natural Vegetation of Oregon and Washington, U.S. Government Printing Office, Washington, D.C., 417 pages, illustrated.

[5] Volland, Leonard A., Plant Communities of the Central Oregon Pumice Zone, USDA Forest Service, Pacific Northwest Region, Portland, Oregon, January, 1976, 133 pages, illustrated.

The lodgepole/currant-bitterbrush/needlegrass community is represented by two small areas on the eastern boundary of the RNA. This plant community is a topodaphic climax of the sandy, pumiceous, ash and lapilli soils. Slopes are near zero. Lodgepole dominates both overstory and regeneration. The stands have been recently thinned. Thinned basal areas are between 100 feet$^2$/acre (23 meters$^2$/ha.) and 140 feet$^2$/acre (33 meters$^2$/ha.). Remaining stems are 5 to 10 inches (13 to 25 centimeters) in diameter and 30 to 80 feet (9 to 24 m.) tall. Cubic foot site class is 50 to 83 feet3/per year. The understory is depauperate. Squaw currant dominates the shrub layer. Bitterbrush (*Purshia tridentata*) is common. Thurber's needlegrass (*Stipa thurberiana*) dominates the ground layer.

The ponderosa/bitterbrush-manzanita/needlegrass plant community occurs on the shallow, stony soils north of Mokst Butte. In this area Mokst lava flows have been covered with ash from later eruptions of the butte. Ponderosa pine occur as a topodaphic climax. All ages of lodgepole pine are present. Stands have been recently thinned to an average basal area of 70 feet$^2$/acre (16 meters$^2$/ha.). Remaining mature trees average 70 to 80 feet (21 to 24 m.) in height and 16 inches (41 cm.) d.b.h.[6] Regeneration is primarily ponderosa pine. Little lodgepole is present. Bitterbrush and green-leaf manzanita (*Arctostaphylos patula*) dominate the shrub layer. Pinemat manzanita and gland ocean-spray are common on lava outcrops. Thurber's needlegrass dominates the ground layer.

The ponderosa/bitterbrush-snowbrush/needlegrass community occupies the rims and south slopes of both cinder cones and highest part of the rampart to the northwest of Mokst Butte. Soils are deep accumulations of coarse cinders, ash, and pumice. Ponderosa pine is again a topodaphic climax. The ponderosa pine overstory is scattered. This community begins about a third of the way up the south side of the small cinder cone. Slope averages 50 percent. Surface soils are composed of large red cinders. Regeneration is all ponderosa pine. As the slope is ascended the basal area of ponderosa pine decreases and green-leaf manzanita increases. Basal area of ponderosa pine averages 70 feet$^2$/acre (16 meters$^2$/ha.). Stems average 15 inches (38 cm.) in diameter and 80 feet (24 m.) in height. Largest individuals reach 38 inches (97 cm.) d.b.h. Many of the older trees bear fire scars. The entire butte has been selectively logged. Common snowbrush (*Ceanothus velutinus*) and green-leaf manzanita are the dominant shrubs. Squaw currant is common. Some bitterbrush and gland ocean-spray are found on the rim of the cone. Herbs and grasses are rare. Davidson's penstemon (*Penstemon davidsonii*), toothleaf pyrola (*Pyrola dentata*), whitevein pyrola (*Pyrola picta*) and rockcress species (*Arabis* species) are some of the herbs found on the small cinder cone. The rim and south slope of Mokst Butte are sparsely vegetated. The south slope of the cone is actually the south facing crater wall. The slope of the crater wall is close to 80 percent. Most

[6] d.b.h. is an abbreviation of diameter-breast-height. It is the diameter of the steam measured 54 inches (137 cm.) above ground level.

of the ponderosa pine is concentrated not far below the rim. On the rim a few small ponderosa pine, lodgepole pine, white bark pine, and white fir are found. Shrubs dominate the vegetation. Green-leaf manzanita is most abundant with pinemat manzanita and snowbrush less so. No herbs or grasses have been recorded. The highest part of the lava and cinder rampart to the northwest of Mokst Butte is also included in this community. The fissure of the rampart is about 100 feet (31 m.) deep. The summit is very rocky with shallow accumulations of cinder and ash. Ponderosa pine, green-leaf manzanita, and bitterbrush are found on the rim of the fissure. The outer slopes of the rampart grade into the mixed conifer community.

The mixed conifer/snowbrush plant community covers the largest area of the RNA. Approximately 340 acres (138 ha.) are included in this community. It is found on the north slopes of both cinder cones and in the crater of the small cone. In addition, three remnants of Mazama ash also support mixed conifer stands. The exclusion of fire in this century has enabled white fir to dominate over seral ponderosa pine. White fir is the climatic climax. Lodgepole pine is common but seral. South of the pre-Mazaman cinder cone lodgepole dominates the overstory but regeneration includes white fir, ponderosa pine, and lodgepole pine.

Common snowbrush is the dominant shrub with squaw currant subordinate. Scouler willow is occasional. Prince's-pine (Chimaphila umbellata) dominates the ground layer. In the crater of the small cinder cone and near the rim on the north side of the cone, lodgepole becomes subordinate to white fir and ponderosa pine. Ponderosa pine occurs as scattered overstory. White fir is present as all ages and dominates regeneration. Shrubs are green-leaf manzanita, bitterbrush, squaw currant, and snowbrush. Prince's-pine is the dominant herb. On the north slope of the small cinder cone the incidence of ponderosa and lodgepole pine decreases. White fir are large and numerous, dominating both overstory and regeneration. Ponderosa pine is seen only as scattered old growth. Both mature and seedling lodgepole are present. Western white pine regeneration is common. Basal areas approximate 100 feet$^2$/acre (23 meters$^2$/ha.) for white fir, 60 feet$^2$/acre (14 meters$^2$/ha.) for ponderosa pine, 20 feet$^2$/acre (5 meters$^2$/ha.) for lodgepole pine and less than 20 feet$^2$/acre (less than 5 meters$^2$/ha.) for western white pine. White fir averages 6 inches (15 cm.) in diameter and 70 feet (21 m.) in height, with many 16 inches (41 cm.) and up to 40 incn. Basal areas approximate 100 feet$^2$/acre (23 meters$^2$/ha.) for white fir, 60 feet$^2$/acre (14 meters$^2$/ha.) for ponderosa pine, 20 feet$^2$/acre (5 meters$^2$/ha.) for lodgepole pine and less than 20 feet$^2$/acre (less than 5 meters$^2$/ha.) for western white pine. White fir averages 6 inches (15 cm.) in diameter and 70 feet (21 m.) in height, with many 16 inches (41 cm.) and up to 40 inches (102 cm.) d.b.h. and 120 feet (37 m.) tall. Ponderosa pine averages 32 inches (81 cm.) d.b.h. and 90 to 100 feet (27 to 31 m.) in height, up to 40 inches (102 cm.) d.b.h. Lodgepole and western white pine average 6 inches (15 cm.) diameter and 70 feet (21 m.) in height. Western white pine occur up to 15 inches (38 cm.) in diameter. Snowbrush dominates the shrub layer with density decreasing as the canopy increases. Prince's-pine dominates the ground layer. Whitevein pyrola and sticky currant (Ribes viscossissimum) are common. Pines increase at the base of the cone. The larger, older Mokst lava flow abuts the base of the small cinder cone on its north and east sides. A skid road runs along much of the southern edge of the lava flow. Between the lava flow and the cinder cone are many of the largest trees in the RNA. Basal areas are less than on the cone. Shrubs and grasses are more abundant. Several species not common in other parts re ponderosa pine, pinemat manzanita and green-leaf manzanita. Stems are smaller than on the cone. The incidence of western white pine is less. Lodgepole increases on lava outcrops. At the northern base of Mokst Butte old growth ponderosa pine are frequently observed. Lodgepole, white fir, bitterbrush, snowbrush, and green-leaf manzanita are all common. The area has been thinned. White fir dominates the regeneration. The largest individuals are ponderosa pine, the most numerous, lodgepole pine. White bark pine is occasional. Green-leaf manzanita increases with disturbance. The boundary of the partial cut is at the base of the butte. On the lower third of the butte snowbrush is dominant. Scouler willow, gland ocean-spray and green-leaf manzanita are common. Lodgepole dominates the overstory. Ponderosa pine and white fir dominate the regeneration. Western white pine of all ages are abundant. Sticky currant increases as the butte is ascended. Slope averages 45 percent. Soils are shallow and rocky. Shrubs decrease as canopy increases. About halfway up the slope fireweed, Davidson's penstemon, and toothleaf pyrola are common. Basal areas are 120 feet$^2$/acre (28 meters$^2$/ha.) of lodgepole pine and western white pine, and less than 20 feet$^2$/acre (5 meters$^2$/ha.) each of white fir, white bark pine and ponderosa pine. Stems are pole-sized. On the upper third of the slope white fir increases until stands are nearly pure white fir. Sidebells pyrola (_Pyrola secunda_), prince's-pine, sticky currant and mosses occupy the ground layer. Patches of long stolon sedge and large ponderosa pine are occasional just below the rim of the butte. The remaining representations of the mixed conifer community occur on two isolated areas of Mazama pumice. The first of these is an "island" of about 30 acres (12 ha.) within the major lava flow. The area is isolated by the surrounding lava. It is privately owned and has been recently heavily logged. Nearly all ponderosa pine has been removed. Many large white fir remain. Ponderosa pine, lodgepole pine, white fir, and western white pine are all present. White fir dominates the regeneration. Common species include

snowbrush, squaw currant, pinemat manzanita, prince's-pine, Thurber's needlegrass, long stolon sedge and Ross' sedge (_Carex rossii_). Bitterbrush is rare. The other area of Mazama pumice is located east of the major lava flow, north of Mokst Butte. It occurs on all sides of the rampart northwest of Mokst Butte. Vegetation is similar to the area west of the small cinder cone. More Scouler willow and snowbrush is present on the east slope of the rampart.

The fifth plant community is found on the lava flows of Mokst Butte RNA. Very little soil is available to vegetation. A thin deposit of Mokst ash can be seen in some portions of the older flow. Vegetation is sparse. Pines are most successful in this harse site. Estimated total basal area is 20 feet$^2$/acre (5 meters$^2$/ha.). Regeneration is meager. Many of the mature trees in the lava are stunted, broken or contorted. Ponderosa pine and lodgepole pine are dominant. White fir, white bark pine, and western white pine are occasional. Regeneration is mostly lodgepole. Shrubs are the dominant form of vegetation on the lavas. Gland ocean-spray is the dominant shrub. Other species commonly seen are squaw currant, mountain juniper, and pinemat manzanita. No snowbrush has been found on the lava. Davidson's penstemon is the dominant herb. Uncommon species include green-leaf manzanita, western serviceberry, ash penstemon (*Penstemon cinicola*) and lava alumroot (*Heuchera cylindrica*). The younger lava flow east of Mokst Butte has very little vegetation. It appears to be in very early stages of succession. The only shrub noted is gland ocean-spray. Very few lodgepole pine have been found and those only as seedlings. No other plant species have been recorded.

The Mokst Butte Research Natural Area falls within Kuchler's[7]; it is also included in the SAF Cover Type[8].

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[7] Kuchler, A.W., *Potential Natural Vegetation of the Conterminous United States*, American Geographical Society, Special Publication Number 36, illustrated.

[8] Society of American Foresters, *Forest Cover Types of North America, Exclusive of Mexico*, Society of American Foresters, Washington, D.C., 1954, 67 pages, illustrated.

Table 1. Partial list of vascular plants of Mokst Research Natural Area

| | Scientific Name | Common Name |
|---|---|---|
| TREES | Abies concolor | white fir |
| | Pinus albicaulis | white bark pine |
| | Pinus contorta | lodgepole pine |
| | Pinus monticola | western white pine |
| | Pinus ponderosa | ponderosa pine |
| | Populus tremuloides | quaking aspen |
| SHRUBS | Amelanchier alnifolia | western serviceberry |
| | Arctostaphylos nevadensis | pinemat manzanita |
| | Arctostaphylos patula | green-leaf manzanita |
| | Ceanothus velutinus | snowbrush |
| | Chimaphila umbellata | prince's-pine |
| | Holodiscus dumosus | gland ocean-spray |
| | Juniperous communis | mountain juniper |
| | Purshia tridentata | bitterbrush |
| | Ribes cereum | squaw currant |
| | Ribes viscocissimum | sticky currant |
| | Salix scouleriana | Scouler willow |
| | Symphoricarpos albus | common snowberry |
| GRASSES and SEDGES | Carex pensylvanica | long stolon sedge |
| | Carex rossii | Ross' sedge |
| | Festuca idahoensis | Idaho fescue |
| | Sitanion hystrix | bottlebrush squirreltail |
| | Stipa thurberiana | Thurber's needlegrass |
| FORBS | Arabis species | rockcress species |
| | Epilobium augustifolium | fireweed |
| | Eriogonum umbellatum | sulfur buckwheat |
| | Fragaria virginiana | broadpetal strawberry |
| | Heuchera cylindrica | lava alumroot |
| | Penstemon davidsonii | Davidson's penstemon |
| | Penstemon cinicola | ash penstemon |
| | Pyrola asarifolia | alpine pyrola |
| | Pyrola dentata | toothleaf pyrola |
| | Pyrola picta | whitevein pyrola |
| | Pyrola secunda | sidebells pyrola |

## Protection and Management

See direction in Forest Plan for Research Natural Area.

## Timber Resources, Mokst Butte RNA

The existing timber resources are best described as a composite of "stands." The 1978 stand mapping and classification project included all Proposed Research Natural Areas and is used as the basic description of Timber Resources.

# ESTABLISHMENT REPORT
# FOR THE PROPOSED
# MANY LAKES RESEARCH NATURAL AREA
# DESCHUTES NATIONAL FOREST

## Principal Distinguishing Features

The Many Lake Research Natural Area (RNA) includes approximately 700 acres (284 hectares) 3 miles (4.8 kilometers) east of the crest of the Oregon Cascades (Figure 5). The RNA is located 20 miles 32 km.) south of the South Sisters on glaciated uplands. This is a highly diverse area of numerous small lakes, wet meadows and bogs, steep slopes and rock escarpments. Two major lakes are found in the area. Jay Lake in the northwest corner of the RNA is approximately 10 acres (4 ha.) in size. Raft Lake is 1/4 mile (.4 km.) to the south, also about 10 acres (4 ha.) and is the deepest lake in the RNA. Sphagnum (*Sphagnum* species) bogs occupy up to 125 acres (51 ha.) of the proposed area. A wide variety of vegetation is present as a result of the many landtypes. Forests are composed primarily of lodgepole pine (*Pinus contorata*)[1] and mountain hemlock (*Tsuga mertensiana*) on drier sites and Englemann spruce (*Picea engelmannii*), mountain hemlock and white fir (*Abies concolor*)[2] in moist areas.

Wetland herbs and shrubs are abundant. Predominate wildlife species include Roosevelt elk, mule deer, blacktail deer, black bear, wolverine, marten, blue grouse, bald eagle, osprey and herons. Soils range from peat to pumiceous sands. Slopes vary from zero to 50 percent. Elevation falls between 4780 feet (1458 meters) and 5080 feet (1549 m.).

## Justification

The Many Lakes RNA fills two needs identified by the Research Natural Area Needs Workshop in 1973[3]. It fills the high priority need for a typical bog area and

[1] Common and scientific nomenclature follows Hitchock, Leo C. and Arthur Cronquist, Flora of the Pacific Northwest, University of Washington Press, Seattle, Washington, 1973, 730 pages, illustrated.

[2] Grand fir (Abies grandis) and white fir (Abies concolor) form a continuously varying biological complex in easter Oregon. Throughout this report the complex will be referred to as white fir (Abies concolor).

[3] Dyrness, C.T., Jerry F. Franklin, Chris Maser, Stanton A. Cook, James D. Hall and Glenda Faxon, Research Natural Area Needs in the Pacific Northwest, Pacific Northwest Forest and Range Experiment Station, U.S.D.A., Forest Service, Portland, Oregon, 1975, 231 pages.

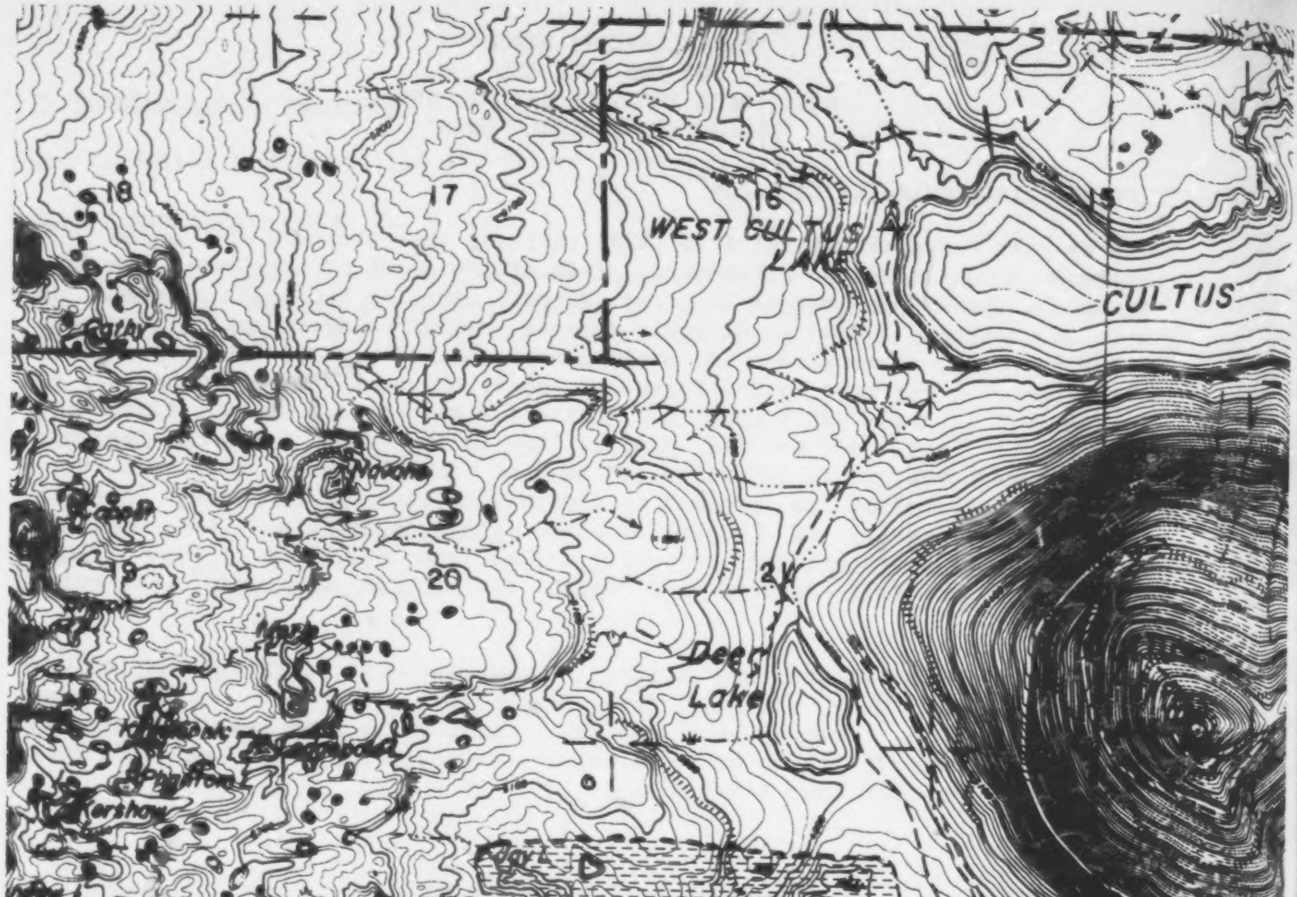

Figure XXVIII

the need for subalpine permanent ponds and bog. The large bogs and several smaller are present in the proposed area and involve over 125 acres (51 ha.). These bogs are at elevations between 4800 feet (1464 m.) and 4940 feet (1507 m.). The major bog in the northeast corner of the RNA has several small, relatively deep ponds and streams near its center. Sphagnum moss dominates the vegetation. Sedges (*Carex* species), rushes (*Juncus* species) and great sundew (*Drosera anglica*) are common in the wetter portions of the bogs. The only other known occurrences of great sundew east of the Cascades are in Gearhart Marsh and 7-Mile Marsh in south-central Oregon. The drier edges of the bogs support shrub species including bog birch (*Betula glandulosa*), willow (*Salix* species), western bog blueberry (*Vaccinium occidentale*), western swamp laurel (Kalmia occidentalis) and Menzies' spirea (*Spirea douglasii*). Englemann spruce is dominant on the edge of the bogs. Lodgepole pine regains dominance as soils become drier. The other large bog further south is not as wet as the first discussed. Open water is represented by one small stream. Shrubs are more prevalent and some Englemann spruce and logepole pine are found within the bog as well as on the borders.

Seventeen small permanent lakes and ponds are present within the proposed RNA. They range in size from about 1 acre (.4 ha.) to approximately 17 acres (7 ha.). The deepest is 10 acres (4 ha.) Raft Lake at an elevation of 4980 feet (1519 m.). Raft Lake possesses a thermocline which protects fish from winter kill. Most of the lakes and ponds including 10 acre (4 ha.) Jay Lake are seldom over 3 feet (.9 m.) deep. Nearly all have some areas dominated by sedges, rushes, and shrubs. Several ponds contain Indian pond lily (*Nuphar polysepalum*). The largest lake is located in the extreme southwest corner of the RNA. This unnamed lake is about 17 acres (7 ha.) in size at 5000 feet (1525 m.) in elevation. It contains the most dense aquatic vegetation of all the lakes and ponds, dominated by Baltic rush (*Juncus balticus*), beaked sedge (*Carex rostrata*) and Indian pond lily. Englemann spruce is common in the forests surrounding the lakes and ponds.

One of the outstanding features of Many Lakes RNA is the sequence of plant succession represented. The range of succession includes deep natural lake, shallow natural lake, wet meadows and bogs, and finally forested land. Adding to the biological diversity of the area is the variety of landforms from steep rock slopes and narrow draws, smooth complex slopes, nearly flat meadows and bogs, to open water. Many vertebrate species are associated with these diverse and complex series of terrestrial and aquatic communities. Several species potentially present in the RNA are designated as rare, threatened, or endangered. The RNA would also provide substantial acreage of moderate to high elevation lodgepole, mountain hemlock and Englemann spruce plant communities.

Many Lakes RNA is surrounded by heavily used recreational land. The Pacific Crest Trail is 3 miles (4.8 km.) to the west. A dirt road used by all-terrain-vehicles throughout the year bounds the RNA on the south. Popular Little Cultus Lake is just east of the RNA, and Deer Lake is 1/4 mile (.4 km.) north of the most northern bog. A primitive trail has been blazed into Raft Lake where fire pits, camp sites, and cut logs are in evidence.

The RNA provides an opportunity to study subalpine aquatics. Studies could also be done on a variety of bog and meadow communities. Very few descriptions exist of subalpine wet meadows and bogs in Oregon. Several unique plants and rare animals present other research possibilites. Plant succession study opportunities are abundant. The subalpine forest communities could serve as reference areas for management research outside the RNA.

## Location

The proposed Many Lakes RNA occupies approximately 700 acres (284 ha.) in the Deschutes National Forest, Bend Ranger District. It is located at North Latitude 43°49' and West Longitude 121°53'. The tract is in the Deschutes County 45 mile (56 km.) southwest of Bend, Oregon. The RNA occupies portions of Sections 28, 29, 32, 33, and 34 of Township 20 South, Range 7 East, Willamette Meridian.

To reach the RNA follow signs to Century Drive and Bachelor Butte out of Bend, Oregon. Six miles (9.6 km.) west of Bend, Century Drive becomes the Cascade Lakes Highway. 3.5 miles (5.6 km.) past the Deschutes Bridge junction, turn right onto Forest Road No. 2022. This is a total of 37.5 miles (60 km.) from the beginning of the Cascade Lakes Highway. In another 4 miles (6.4 km.) turn right onto Forest Road No. 2049 following signs to Little Cultus Lake. Little Cultus Lake Campground is reached in a little over 1 mile (1.6 km.). The extreme southeast corner of the RNA is about 1 mile (1.6 km.) west of the campground on a primitive dirt road. All access to the interior of the RNA is by foot. One primitive trail to Raft Lake begins about 1/4 mile (.4 km.) from the southwest corner of the RNA. No other trails are known.

## Community Types

Plant communities within the RNA change with topography, fire history, and distance from water. Variations are primarily the result of soil depth and moisture and occurrence of fire. Lodgepole pine is the most abundant tree species and occurs on all but the most moist sites. Mountain hemlock is found throughout the RNA. Englemann spruce is most prevalent close to open water and other wet sites. White fir regeneration is widespread. Western white pine of all ages is scattered within the RNA. A few old-growth ponderosa pine (*Pinus ponderosa*) and whitebark pine (*Pinus albicaulis*) are present on rock slopes. White fir and mountain hemlock are the climax species. Lodgepole pine stands are maintained by fire or as a topoclimax species. Ecologically, the communities encountered in the Many Lake RNA best fit into the Tsuga mertensiana Zone[4] of the western slope and crest of the Cascades. This zone is characterized by old-growth mountain hemlock forests and seral lodgepole pine in drier portions. Understories are often depauperate and dominated by huckleberry species (Vaccinium species). Wet meadows and bogs are an important special feature of the zone.

Five plant communities have been identified in the Many Lakes RNA. Four may be correlated to Volland's[5] plant communities as follows:

| Unit | Plant Community | Location | Acres |
|---|---|---|---|
| 1 | Wet meadow MW | Near lakes and bogs | 10<br>(4 ha.) |
| 2 | Engelmann spruce bottomlands CW-C9-11 | Surrounding streams, lakes, and bogs | 75<br>(30 ha.) |
| 3 | Mountain hemlock/grouse huckleberry CM-S1-11 | Most of RNA not recently burned | 200<br>(81 ha.) |
| 4 | Lodgepole pine/grouse huckleberry CL-S4-12 | Driest area of RNA, recent burns | 300<br>(122 ha.) |

Two types of wet meadow plant communities are seen in Many Lakes RNA. The first is the isolated wet meadow surrounded by forest. The second is found on the edges of lakes and ponds. The isolated wet meadow is well represented south of the lake in the southwest corner of the RNA. It is about 4 acres (1.6 ha.) in size and shows a clear relationship of plant species to soil moisture. The majority of the meadow is dominated by beaked sedge, black alpine sedge (*Carex nigricans*), and Baltic rush. Tufted hairgrass (*Deschampsia caespitosa*) is subordinate, occurring in drier areas than the sedges. A small, wet depression at the west end of the meadow is nearly pure northern mannagrass (*Glyceria borealis*). Slimstem reedgrass (*Calamagrostis neglecta*) is common near the edges of the meadow. Shrubs dominate the vegetation at the edge of the forest. This shrub component is dominated by western bog blueberry. Other common shrubs are Menzies' spirea and bearberry honeysuckle (*Lonicera involucrata*). Mosses are also common at the edge of the forest. Surface soils are moist to wet year-round. The relationship of plant species to soil moisture along a gradient from wet to dry, appears to be: northern mannagrass-beaked sedge-black alpine sedge-rushes and reedgrass-tufted hairgrass-shrubs-forest. This may also represent a successional sequence. The other type of wet meadow community occurs along the edge of lakes and ponds where the soils are wet to ponded all year. The plant community is simple in these locations, usually consisting of one to three species of sedges and rushes. The most common species are beaked sedge, black alpine sedge and Baltic rush. Approximately 5 acres (2 ha.) of this type occur in the RNA.

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[4] Franklin, Jerry F., and C.T. Dryness, Natural Vegetation of Oregon and Washington, U.S. Government Printing Office, Washington, D.C., 1973, 417 pages, illustrated.

[5] Volland, Leonard A., Plant Associations of the Central Oregon Pumice Zone, U.S.D.A. Forest Service Pacific Northwest Region, Portland, Oregon, September, 1982. R6-Ecol-104-1982. 122 p.

Englemann spruce bottomlands are found on moist sites near streams, lakes, bogs, and wet meadows. Variation of tree species within this community is great. In many areas, lodgepole pine dominates the overstory as old growth, but the understory will be Englemann spruce, mountain hemlock, and white fir. In other areas mountain hemlock will dominate the overstory, or may be present only as regeneration. White fir and spruce generally dominate the regeneration and are the climax species. Large western white pine (*Pinus monticola*) up to 33 inches (84 centimeters) in diameter and 120 feet (37 m.) in height are scattered within this community and are seral. In all variations, Englemann spruce is present as mature trees and regeneration. Some of the largest spruce reach 41 inches (104 cm) d.b.h.[6] and 120 feet (37 m.) in height. This plant community has the richest herbaceous layer of the forested types. One location of this community is south and west of the large lake in the southwest corner of the RNA. This is a very moist site in which mountain hemlock dominates the overstory. Englemann spruce and white fir are the next most common tree species.

Very little lodgepole pine is present. Regeneration is mostly white fir, then spruce. Few shrubs are present, primarily represented by prickly currant (*Ribes lacustre*) and big huckleberry (*Vaccinium membranaceim*). Near streams, water birch (*Betula occidentailis*) often is dominant. Common herbs are arrowleaf groundsel (*Senecio triangularis*), starry solomon-plume (*Smilacina stellata*), prince's pine (*Chimaphila umbellata*), bigleaf lupine (*Lupinus polyphyllus*), queen's cup (*Clintonia uniflora*), western twinflower (*Linnaea borealis*), and coolwort foamflower (*Tiarella trifoliata*).

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[6] d.b.h. is an abbreviation of diameter-breast height and is the diameter of the tree stem measured 54 inches (137 cm.) above ground level.

The mountain hemlock/grouse huckleberry and lodgepole pine/grouse huckleberry plant communities occupy the remainder of the RNA and similar dry sites. The mountain hemlock community is a climax situation which tends towards moister sites and those that have not been recently burned. Surface soils are relatively dry, coarse, and often shallow and rocky. Understories are dominated by regeneration of hemlock, white fir, and occasional lodgepole. The herbaceous layer is depauperate. Grouseberry (*Vaccinium scoparium*) dominates the shrub layer and is often the only component of the ground layer. Pinemat manzanita (*Arctostaphylos nevadensis*) is common on rock outcroppings. Tree stands in this community are most often pole-sized with stems averaging 8 to 12 inches (20 to 30 cm.) in diameter and 80 feet tall. On somewhat moist sites occasional Englemann spruce are seen. Western white pine of all ages are scattered throughout the community. In a relatively productive area western hemlock is present with diameters up to 24 inches (61 cm.) and basal area of 140 feet$^2$/acre (32.6 meters$^2$/ha.), western white pine up to 28 inches (71 cm.) d.b.h. and 40 feet$^2$/acre (9.3 m.$^2$/ha.), Englemann spruce with basal area of 40 feet$^2$/acre (9.3 m.$^2$/ha.), lodgepole pine and white fir each less than 20 feet$^2$/acre (4.7 m$^2$/ha.). On one escarpment the incidence of western white pine increases substantially and lodgepole pine decreases. Several ponderosa pine are present with average 34 inches (86 cm.) in diameter and 130 feet (40 m.) in height. Golden chinquapin (*Castanopsis chrysophylla*) is found on the east side of some rock slopes. Other understory species found in this community include sticky currant (*Ribes viscossis-simum*), broadpetal strawberry (*Fragaria virginiana*) and long-stolon sedge (*Carex pensylvanica*).

The lodgepole pine/grouse huckleberry plant community occurs on some of the direst sites in the RNA and on areas recently burned. This is a seral community maintained by fire or occasionally climax due to severe microclimate and poorly developed soils. Lodgepole dominates the overstory in pole-sized stands. Regeneration is white fir and mountain hemlock with little lodgepole. Understories are scanty. Components of the shurb layer are sticky currant, grouse huckleberry, and pinemat manzanita. Common herbs are western yarrow (*Achillea millefolium*), goldenrod (*Solidago* species), broadpetal strawberry and broadleaf lupine (*Lupinus latifolius*). Small patches occur within this community where lodgepole totally dominates the overstory and broadleaf lupine the ground layer. Regeneration is nearly pure hemlock. These appear to be areas which have been burned and are slow to recover due to immature soils. Another variation of this community is observed on moist east slopes. Here white fir becomes the understory dominant and other common species are hemlock, spruce, and white pine regeneration, myrtle pachistima (*Pachistima myrsinites*), prince's pine and western twinberry. Stands are pole sized with lodgepole averaging 8 inches (20 cm.) d.b.h. and 100 feet (31 m.) in height. On rocky soils the size of the lodgepole drops to an average 6 inches (15 cm.) in diameter and 70 feet (21 m.) in height. On some north slopes, prince's pine becomes the dominant herb and the occurrence of western white pine increases substantially. Some of the plant species seen on rock outcroppings in the lodgepole community include mountain lover, sticky currant, gland ocean-spray (*Holodiscus dumosus*), western serviceberry (*Amelanchier alnifolia*), squaw carpet

(*Ceanothus prostratus*), bottlebrush squirreltail (*Sitanion hystrix*) and needlegrass (*stipa* species). Throughout the community the basal area of lodgepole averages 120 ft.$^2$/ha.).

The fifth plant community of the Many Lakes RNA is one not described by Volland. The bog area of the RNA are a mosaic of subalpine wet meadow communities. Campbell[7] described a *Carex-Sphagnum* community in a small valley near Mt. Jefferson. The description is similar to portions of the bogs in Many Lakes RNA. The *Carex-Sphagnum* plant community is a bog type in which moving water is found at the level of the moss layer all year. It is found in the wettest parts of the bogs, primarily in the extreme northeast bog of the RNA. Beaked sedge and sphagnum moss are the major dominants and willow is an invader.

Other common species are great sundew, bog saxifrage (*Saxigraga oregana*), slender cotton-grass (*Eriophorum gracile*), Drummond's cinquefoil (*Potentilla drummondii*), Jeffrey's shooting star (*Dodecathaon jeffreyi*) and elephant's head (*Pedicularis groenlandica*). On less wet areas shrubs dominate the vegetation. Dominant shrubs are bog birch and western bog blueberry. Other common shrubs are swamp laurel and willow. Still other portions of the bogs are dominated by herbs and rushes. Here common ground layer components are Baltic rush, sticky tofieldia (*Tofieldia glutinosa*), purple cinquefoil (*Potentilla palustris*) and white marsh marigold (*Caltha biflora*), in addition to many already named.

Many Lakes Research Natural Area falls within Kuchler's[8]. It is also included in the SAF cover type.[9]

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[7] Campbell, Alcetta Gilbert, *Vegetative Ecology of Hunt's Cove, Mt. Jefferson, Oregon*, 1973, 89 pages, illustrated. (Unpublished M.S. thesis on file at O.S.U., Corvallis, Oregon.)

[8] Kuchler, A.W., *Potential Natural Vegetation of the Conterminous United States*, American Geographical Society, Special Publications Number 36, illustrated.

[9] Society of American Foresters, *Forest Cover Types of North American, Exclusive of Mexico*, Society of American Foresters, Washington, D.C., 1954, 67 pages, illustrated.

Table 1. Tentative list of Vascular Plants of Many Lakes Research Natural Area

| | Scientific Name | Common Name |
|---|---|---|
| TREES | Abies concolor | white fir |
| | Picea engelmannii | Engleman spruce |
| | Pinus albicaulis | white bark pine |
| | Pinus contorta | lodgepole pine |
| | Pinus moticola | western white pine |
| | Pinus ponderosa | ponderosa pine |
| | Pseudotsuga menziesii | Douglas fir |
| | Tsuga mertensiana | mountain hemlock |
| SHRUBS | Amelanchier alnifolia | western serviceberry |
| | Arctostaphylos nevadensis | pinemat manzanita |
| | Arctostaphylos patula | green-leaf manzanita |
| | Betula glandulosa | bog birch |
| | Betula occidentalis | water birch |
| | Castanopsis chrysophylla | golden chinquapin |
| | Ceanothus prostratus | squaw carpet |
| | Gaultheria humifusa | alpine wintergreen |
| | Holodiscus dumosus | gland ocean-spray |
| | Kalmia occidentalis | western swamp laurel |
| | Lonicera involucrata | bearberry honeysuckle |
| | Paschistima myrsinites | myrtle pachistima |
| | Ribes lacustre | prickly currant |
| | Ribes viscosissimum | sticky currant |
| | Salix species | willow species |
| | Spirea douglasii | Menzies' spirea |
| | Vaccinium membranaceum | big huckleberry |
| | Vaccinium occidentale | western bog blueberry |
| | Vaccinium scoparium | grouseberry |
| SEDGES and RUSHES | Carex disperma | soft leaved sedge |
| | Carex muricata | muricate sedge |
| | Carex nigricans | black alpine sedge |
| | Carex pensylvanica | long-stolen sedge |
| | Carex rostrata | beaked sedge |
| | Juncus balticus | Baltic rush |
| | Juncus mertensianus | Mertens' rush |
| GRASSES | Calamagrostis inexpansa | narrow-spiked reedgrass |
| | Calamagrostis neglecta | slimstem reedgrass |
| | Calamagrostis rubescens | pinegrass |
| | Danthonia intermedia | timber oatgrass |
| | Deschampsia cespitosa | tufted hairgrass |
| | Eriophorum gracile | slender cotton-grass |
| | Festuca species | fescue species |
| | Glyceria borealis | northern mannagrass |

Table 1. (Continued)

| | Scientific Name | Common Name |
|---|---|---|
| GRASSES | Glyceria striata | fowl mannagrass |
| | Sitanion hystrix | bottlebrush squireltail |
| | Stipa species | needlegrass species |
| | Glyceria striata | fowl mannagrass |
| | Sitanion hystrix | bottlebrush squireltail |
| | Stipa species | needlegrass species |
| FORBS | Achillea millefolium | western yarrow |
| | Actea rubra | western red baneberry |
| | Arnica mollis | hairy arnica |
| | Aster foliaceous | leafy aster |
| | Athyrium felix-femina | lady-fern |
| | Caltha biflora | white marsh marigold |
| | Castilleja miniata | scarlet paintbrush |
| | Chimaphila umbellata | prince's-pine |
| | Clintonia uniflora | queen's cup |
| | Cornus canadensis | bunchberry |
| | Dodecatheon jeffreyi | Jeffrey's shooting star |
| | Drosera anglica | great sundew |
| | Epilobium species | willow-herb species |
| | Equisetum palustre | marsh horsetail |
| | Fragaria vesca | woods strawberry |
| | Fragaria virginiana | broadpetal strawberry |
| | Galium aparine | cleavers |
| | Hypericum formosum | western St. John's-wort |
| | Linnaea borealis | western twinflower |
| | Lupinus latifolius | broadleaf lupine |
| | Lupinus polyphyllus | bigleaf lupine |
| | Mimulus primuloides | primrose monkey-flower |
| | Mitella breweri | Brewer's mitrewort |
| | Nuphar polysepalum | Indian pond lily |
| | Pedicularis groenlandica | elephant's head |
| | Pedicularis racemosa | leafy lousework |
| | Polemonium occidentale | western polemonium |
| | Polystichum munitum | common christnas-fern |
| | Potentilla drummondii | Drummond's clinquefoil |
| | Potentilla palustris | purple clinguefoil |
| | Pyrola asarifolia | alpine pyrola |
| | Rumex occidentalis | western dock |
| | Saxifraga oregana | box saxifrage |
| | Senecio triangularis | arrowleaf groundsel |
| | Smilacina stellata | starry solomon-plume |
| | Solidago species | goldenrod species |
| | Tiarella trifoliata | coolwort foamflower |
| | Tofieldia glutinosa | sticky tofieldia |
| | Trifolium longipes | long-stalked clover |

| | |
|---|---|
| Trillium ovatum | white trillium |
| Veratrum californicum | California false hellebore |
| Veronica species | speedwell species |
| Viola species | violet species |
| Xerophyllum tenax | beargrass |

TIMBER RESOURCES: Many Lakes RNA

The existing timber resources are best described as a composite of "stands". The 1978 stand mapping and classification project included all proposed Research Natural Areas and is used as the basic description of Timber Resources.

# DRAFT ESTABLISHMENT REPORT FOR
# TORREY-CHARLTON RESEARCH NATURAL AREA
# WILLAMETTE AND DESCHUTES NATIONAL FORESTS

## Principal Distinguishing Features

Torrey-Charlton Research Natural Area (RNA) contains excellent representatives of mountain hemlock (*Tsuga mertensiana* [Bong.] Carr.)[1] forests, and lakes and ponds of the High Cascades of Oregon. The Research Natural Area is divided into two units having different principal distinguishing features. The Torrey Unit contains an abundance of lakes and ponds. The Charlton Unit contains a variety of mountain hemlock stands of different ages and densities. ((See Figure 6.)

The variety of standing water (lentic) habitats in the Torrey Unit ranges from ephemeral ponds which dry up in late spring or summer, to permanent lakes with trout populations. Many of the lakes and ponds are isolated with no interconnecting drainages. One chain of lakes in the RNA is connected; however, during spring runoff. The variety of lentic habitats with differing degrees of isolation provides for aquatic communities with strikingly different phytoplankton, zooplankton, invertebrate, and vertebrate composition.

Excellent examples of mountain hemlock-dominated forest, an important forest type in the High Cascades, are found on both units of the RNA. Old-growth (400-year-old) mountain hemlock stands occur on all aspects on the conical Charlton Butte for which one of the units is named. This butte which rises 600 feet (183 m) above the High Cascade Plateau makes the Charlton Unit particularly valuable as a mountain hemlock-oriented RNA. Scattered *Phellinus* (*Poria*) *weirii* (laminated root rot) infestations over the rest of the RNA create islands of seral stands within a matrix of old-growth (350+ years) mountain hemlock forests that are typical of Oregon's High Cascades.

## Justification

Much of the High Cascades of Oregon is a wide, gently sloping plateau with scattered volcanic peaks. Major features of this landscape are an abundance of small lakes and ponds and extensive mountain hemlock forests. A Research Natural Area which combines these features is a logical addition to a natural area system which seeks to preserve examples of all significant natural ecosystems for comparison with those influenced by man.

[1] Nomenclature follows Hitchcock, C.L. and A. Cronquist. 1973 *Flora of the Pacific Northwest*. Univ. Wash. Press, Seattle, Wash. 730 p.

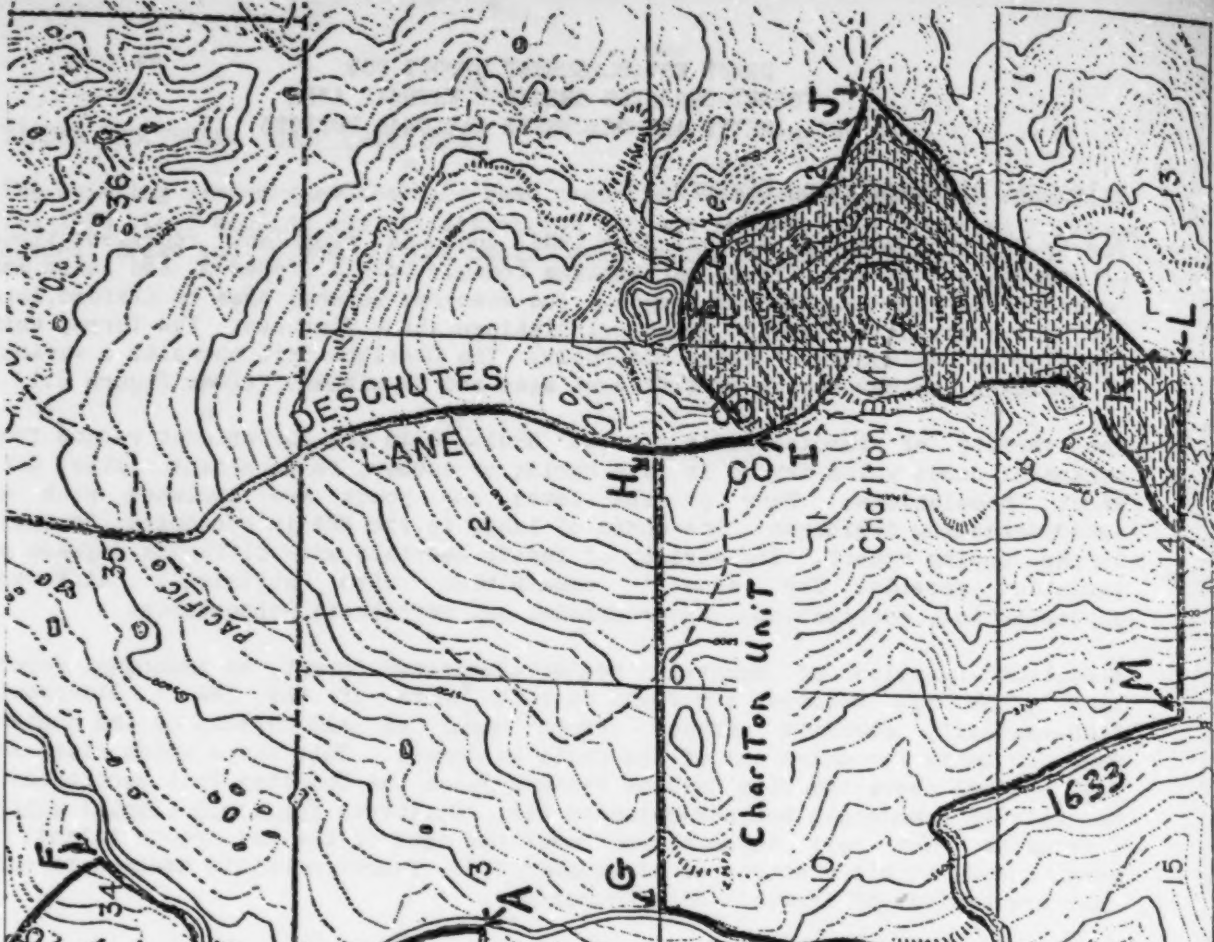
DESCHUTES
LANE
PACIFIC
Charlton Unit
Charlton Butte
Lily Lake
Torrey Unit
Cervus Lake
Priscilla Lake
N. Torrey Lake
Wahanna Lake
Harvey Lake
NORTH WALDO
LAKE
1633
2049
5600
5508
A
B
C
D
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Figure XXIX

The need for such an area was recognized by the Pacific Northwest Natural Area Needs Task Force. Table 64 of their report, "Research Natural Area needs in the Pacific Northwest, a contribution to land use planning"[2] lists this very need as a priority item.

The reasons for this are quite clear. Burgeoning regional and national populations are placing unprecedented demands on both recreational and timber resources. Until quite recently, the High Cascades were used solely for recreation, and that use was light and seasonal. Increasing year-round recreation use, and pressures to manage mountain hemlock forests for timber production make establishment of the Torrey-Charlton Research Natural Area timely.

The High Cascade ecosystems contained in the RNA are poorly understood, and their wise management will require substantially more knowledge than is currently available. Torrey-Charlton RNA provides an excellent natural laboratory in which the natural ecology of lakes and ponds in mountain hemlock watersheds and the forests themselves can be studied. An understanding of how these systems function in their natural state is prerequisite to sound evaluations of effects of different management practices.

As an example, the Oregon Fish and Game Commission has been stocking High Cascade lakes and ponds for decades with several species of trout. Very little research has been conducted on survival rates of the planted fish or the stocking effects on the aquatic community as a whole. Preliminary research in Torrey Unit by Drs. Kenneth Cummins and James Sedell indicate dramatic aquatic community differences between lakes which may, in part, be related to stocking differences. Fundamental questions such as these can be addressed in the RNA.

Difficulty of access is often offered as a reason for the paucity of past research on High Cascade lakes. Access is excellent in the Torrey Unit during the snowfree period. The Taylor Burn road (Forest Service No. 2049) parallels the east boundary. The lakes and ponds within the Unit are a mile hike or less from this road.

The array of lakes and ponds in the Torrey Unit is representative of much of the variation to be found within the High Cascade portion of the Willamette National Forest. Results from research in Torrey Unit would have wide ranging applicability.

Although much of the old-growth mountain hemlock forests of Oregon's High Cascades are in Wilderness Areas or Recreation Areas, large tracts remain which

[2] Dyrness, C.T., J.F. Franklin, Chris Maser, Stanton A. Cook, James D. Hall, and Glenda Faxon. 1975. Research Natural Area needs in the Pacific Northwest, a contribution to land-use planning. USDA For. Serv. Gen. Tech. Rep. PNW-38, 231 p.

could be managed for their timber resources. Because mountain hemlock has not been an important timber species in the past, very little research has been conducted in mountain hemlock dominated ecosystems. Questions remain as to growth rates and patterns, regeneration requirements, silvicultural systems, genetic variation, pest and pathological problems, successional patterns, etc.

The Charlton Unit of the RNA supports excellent examples of old-growth mountain hemlock forests. Aspect and elevation effects on productivity and composition can be examined on the conical Charlton Butte within the Unit.

Permanent vegetation plots have been located by PNW ecologists along a 2.6 km (1.6 mile) transect which ascends the Charlton Butte. More permanent plots will be placed in Charlton Unit as part of ongoing research on the ecology of upper slope conifers in the Pacific Northwest. Specifc processes being examined include succession, productivity, and decomposition.

Questions on the patholoy of Phellinus (Poria) weirii (laminated root rot) and its effect on stand dynamics can be examined in the Unit. An understanding of these processes (and others) as they occur in undisturbed systems will permit a more accurate evaluation of the effects of timber management on this ecosystem. Charlton Unit provides an excellent "benchmark" area for such comparative studies.

## Location and Access

The Torrey-Charlton RNA lies on the crest of the Oregon Cascades about 55 air miles (88 km) ESE of Eugene. Torrey Unit (940 acres, 380 ha) is completely within the Willamette National Forest, and includes portions of Sec. 33 and 34, T. 20 S., R. 6 E., and secs. 3 and 4, T. 21 S., R. 6 E., Willamette Meridian. The 1720-acre (695 ha) Charlton Unit centered on Charlton Butte, includes portions of the Deschutes National Forest (520 acres, 210 ha) as well as the Willamette National Forest (1200 acres, 485 ha). It occupies portions of secs. 10, 11, 12, 13, 14, and 15 T. 21 S., R. 6 E.

Access to both units of the RNA is excellent. The Charlton Unit is easily reached by U.S. Forest Service Road No. 204 and a side road off No. 204, No. 1633. The Pacific Crest Trail (No. 2188) passes through the middle of the Unit. Torrey Unit is easily reached by U.S. Forest Service Road No. 2049 which joins No. 1633 near North Waldo Campground. Road No 2049 (Taylor Burn Road) forms a part of the west boundary of the Charlton Unit and a part of the east boundary of the Torrey Unit allowing easy road access with those portions of the RNA.

## Physical and Climatic Conditions

Torrey-Charlton RNA lies within the High Cascades physiographic province, a broad weakly dissected undulating plateau with scattered volcanic peaks. The elevation of the plateau in the Torrey Unit is about 5400 feet (1650 m) rising abruptly to 5800 feet (1792 m) on Taylor Butte. In the Charlton Unit the plateau slopes gradually to the west rising from 5500 feet to 6000 feet (1675 to

1830 m) at the base of Charlton Butte. This conical butte rises abruptly to about 6600 feet (2010 m).

The High Cascades are developed on andesitic and basaltic flows of the Pliocene Epoch. The plateau formed from a series of composite volcanoes from which quietly flowed great quantities of lava, alternating with short periods of explosive eruptions.

The geomorphology of the RNA has developed from four separate processes: (1) the formation of the Boring Lava and Volcanic Rocks including cinder cones, scoriaceous materials, and andesites and basalts; (2) mountain and alpine glaciation; (3) pumice and ash deposition from Mount Mazama (Crater Lake); and (4) recent development of organic and mineral soil deposits.

Soils within the RNA are generally deep to moderately deep, light-colored pumice soils overlaying dark-colored, medium-textured soils. Taylor Butte and Charlton Butte have deep light-colored pumice soils over a reddish, cindery, buried soil.

Some of the soil characteristics for the RNA are presented in Table 1. These are divided into soils of the plateau area and soils of the buttes within the RNA. The data are from an unpublished manuscript by Mr. Lew Manhart, on file at the Supervisor's Office, Willamette National Forest, Eugene, Oregon.

The climate of the area is cool and wet with much of the precipitation falling as snow. Annual precipitation ranges from 1600 to 2200 mm (63 to 87 in), about three-fourths of which falls as snow. Snowpacks of 5 m (16.5 ft) are not uncommon. A 6-month duration of snowpack is typical, but in certain years it can persist for 8 months.

Average annual temperature is probably about 3.56°C (38°F), with average January and July temperatures of about -3.5° and 13.5°C (25.5 and 56°F) respectively. Average January minimums of -8.5°C (16.5°F) and average July maximums of 21.5°C (70.5°F) are likely, based on records from similar locations in the Oregon High Cascades.

## Terrestrial Ecosystems

**Vegetation**: Both Torrey and Charlton Units provide excellent examples of mountain hemlock-dominated ecosystems of Oregon's High Cascades. Mountain hemlock stands tend to be monotonous forests with little understory vegetation and low species diversity (plant and animal) under closed canopy conditions. Torrey-Charlton RNA is no exception. While mountain hemlock stands are poor in vascular plant diversity, they are extremely rich in fungal species diversity, however.[3]

Considerable structural diversity exists in the RNA, also. Age and height of dominants and stand basal area varied from 100 to 400 years, 20 to 40 meters (65.5 to 131.2 ft) and 30 to 130 $m^2$/ha (130 to 560 $ft^2$/acre) respectively on plots placed in the RNA. This degree of variation compares favorably with that found in stands sampled from Windigo Pass (30 miles or 48 km south) to Broken Top (30 miles or 48 km northeast[4]). It is also comparable to stands sampled in the Mount Hood National Forest.

Over most of the RNA, mountain hemlock is the dominant tree species in the overstory. Lodgepole pine (*Pinus contorta* Dougl. var. *lati-folia* Engel.) and Pacific silver fir (*Abies amabilis* [Dougl.] Forbes) are minor components of the overstory in general, but constitute a larger proportion of the stand in the drier and wetter areas, respectively.

Other tree species occasionally found in the RNA include: western white pine (*Pinus monticola* Dougl.), subalpine fir (*Abies* lasiocarpa [Hook.] Nutt.) and Shasta red fir (*Abies magnifica* Murr. var. *shastensis* Lemm.). A sparse shrub layer, generally less than 50 percent cover, of grouse huckleberry (*Vaccinium scoparium* Leiberg) is typical of closed stands. The herb layer tends to have few species, with low cover values of generally less than 1 percent. Typical herb species are: fringed pinesap (*Hypopitys monotropa* Crantz), one-sided wintergreen (*Pyrola secunda* L.) and two sedges *Carex rossii* Boott and *C. pensylvanica* Lam. Moss and lichen cover on the ground is generally less than 0.1 percent.

Scattered through this type of forest are islands of *Phellinus* (*Poria*) *weirii* (laminated root rot) infection. When viewed from the air, these *Phellinus* pockets have a bull's-eye appearance caused by an outer ring of dead and dying trees, an inner ring of seedling establishment and growth and frequently an inner circle of dead and dying trees. In places, these enlarging islands have coalesced to form irregular patches. Vascular plant species diversity increases greatly in these areas which are open to colonization. The edge effect of the *Phellinus* infection centers seem to enhance bird species diversity as well.

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[3] Personal communication from Dr. James Trappe, Forestry Sciences Laboratory, Pacific Northwest Forest and Range Experiment Station, Corvallis, Oregon.

[4] Unpublished data on file at Forestry Sciences Laboratory, Pacific Northwest Forest and Range Experiment Station, Corvallis, Oregon.

The life cycle of Phellinus (Poria) weirii is not well known. The long-term patterns of expansion of the infected areas and subsequent plant colonization and fungal reinfection is presently under study. Successional patterns in uninfected areas are hypothetical at present. The effects of Phellinus infection are even less understood in terms of likely successional trends. Torrey-Charlton RNA offers an excellent field site for studies of these processes.

In summary, while not all of the forest types within which mountain hemlock is found are contained in the RNA, the area is typical of closed mountain hemlock forests of the High Cascades. Productivity, succession, decomposition and pathology studies can be focused in Torrey-Charlton RNA, the results of which should have wide applicability.

Terrestrial Vertebrates: As mentioned in the previous section, Torrey-Charlton RNA tends to be relatively poor in terms of vertebrate species. The RNA's fauna is representative of much of the High Cascades.

Table 2 lists the vertebrate species known to utilize Torrey-Charlton RNA for at least a portion of the year. The list is compiled from direct observation of animals or obvious sign. Due to the lack of sampling it is a brief list, and certainly under-represents what is actually there.

Small mammal trapping was done in mid-September 1976 in four separate locales in the RNA. In over 1000 trap-days only 23 animals were captured: 2 Townsend chipmunks (Eutamias townsendi), 3 wandering shrews (Sorex vagrans), 10 California red-backed voles (Clethrionomys californicus) and 8 deer mice (Peromyscus maniculatus). Because the sampling was conducted just one time for only 10 days it is impossible to state that small mammal populations are always low in the RNA. Trap lines run in other closed canopy mountain hemlock stands have indicated higher populations.[5]

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[5] Personal communication from Mr. Chris Maser, Biologist, Bureau of Land Management, Vale, Oregon.

Table 2. Terrestrial vertebrates known to utilize the Torrey-Charlton Research Natural Area for at least some of the year. List compiled from field observations of individuals or positive signs.

REPTILES AND AMPHIBIANS

| Common Name | Scientific Name |
|---|---|
| Salamanders | |
| Family Ambystomatidae | |
| Pacific giant salamander | Dicamptodon ensatus |
| Northwestern salamander | Ambystoma gracile |
| Family Salamandridae | |
| Rough-skinned newt | Taricha granulosa |
| Frogs and Toads | |
| Family Ascaphidae | |
| Tailed frog | Ascaphus truei |
| Family Bufonidae | |
| Western toad | Bufo boreas |
| Family Ranidae | |
| Cascade frog | Rana cascadae |
| BIRDS | |
| Family Aythyinae | |
| Barrow's goldeneye | Bucephala islandica |
| Family Cathartidae | |
| Turkey vulture | Carthartes aura |
| Family Accipitrinae | |
| Cooper's hawk | Accipiter cooperi |
| Family Buteoninae | |
| Red-tailed hawk | Buteo jamaicensis |
| Family Tetraonidae | |
| Blue grouse | Dendragapus obscurus |

| | |
|---|---|
| Family Picidae | |
| Red-shafted flicker | Colaptes cafer |
| Pileated woodpecker | Dryocopus pileatus |
| Hairy woodpecker | Dendrocopos villosus |
| Family Hirundinidae | |
| Violet-green swallow | Tachycineta thalassina |

BIRDS

| Common Name | Scientific Name |
|---|---|
| Family Corvidae | |
| Gray jay | Perisoreus canadensis |
| Steller's jay | Cyanocitta stelleri |
| Common raven | Corvus corax |
| Clark's nutcracker | Nucifraga columbiana |
| Family Paridae | |
| Black-capped chickadee | Parus atricapillus |
| Family Sittidae | |
| Red-brested nuthatch | Sitta canadensis |
| Family Certhidae | |
| Brown creeper | Certhis familiaris |
| Family Turdidae | |
| Robin | Turdus migratorius |
| Varied thrush | Ixorens naevius |
| Townsend's solitaire | Myadestes townsendi |
| Family Sylviidae | |
| Golden-crowned kinglet | Regulus satrapa |
| Ruby-crowned kinglet | Regulus claendula |
| Family Parulidae | |
| Townsend's warbler | Dendroica townsendi |
| Family Fringillidae | |
| Evening grosbeak | Hesperiphona vespertina |
| Pine siskin | Spinus pinus |
| Oregon junco | Junco oreganus |

MAMMALS

| | |
|---|---|
| Order Insectivora | |
| Trowbridge shrew | Sorex trowbridgii |
| Wandering shrew | Sorex vagans |
| Order Lagomorpha | |
| Snowshoe hare | Lepus americanus |
| Pika | Ochotona princeps |
| Order Rodentia | |
| California red-backed vole | Clethrionomys californicus |
| Yellow-pine chipmunk | Eutamias amoenus |
| Townsend chipmunk | Eutamias townsendi |
| Bushy-tailed wood rat | Neotoma cinera |
| Deer mouse | Peromyscus maniculatus |
| Golden mantled ground squirrel | Spermophilus lateralis |
| Chickaree | Tamiasciurus douglasi |

MAMMALS

| | |
|---|---|
| Order Carnivora | |
| Coyote | Canis latrans |
| Bobcat | Lynx rufus |
| Black bear | Ursus americanus |
| Order Artiodactyla | |
| Roosevelt elk | Cervus canadensis subspecies roosevelti |
| Black-tailed deer | Odocoileus hemionus subspecies columbianus |
| Mule deer | Odocoileus hemionus subspecies hemionus |

### Aquatic Ecosystem

A wide variety of lakes and ponds exist within the Torrey Unit of the RNA--from ephemeral snowmelt ponds which dry up in spring after runoff to permanent lakes with resident trout populations. This variation covers much of the natural variation to be found in Oregon's High Cascades.

Many of the lakes and ponds on Torrey Unit are isolated from one another with no interconnecting streams--even during spring runoff. In the northern portion of Torrey Unit several lakes are connected by a stream except in late summer of the driest years. The lakes and ponds differ in area and depth. A wide range in the abundance of emergent aquatic plants exist. This variety of sizes and depths and degree of isolation provides the setting for strikingly different aquatic communities.

Drs. James Sedell and Kenneth Cummins collected from a representative set of lakes and ponds in the Torrey Unit in mid-September 1976. The beds of emphemeral ponds were examined and collections made. Bottom samples and plankton net tows were made on several lakes. Scuba gear was used to examine the bottoms of the deeper lakes.

Their collections revealed rich aquatic communities which differed widely in phytoplankton, zooplankton, and invertebrate composition.

Drs. Sedell and Cummins think that the different stocking programs for lakes within the area may account for some of the variation observed. The Oregon Fish and Game Commission's stocking program for the Torrey Unit is given in Table 3. This possibility is intriguing because of the management implications, which are an ability to change a lake's natural processes by altering the fish species stocked. This is an area of research which could easily be addressed on the Torrey Unit.

In conclusion, the ecological diversity of the lakes and ponds, plus the relative ease of access, which allows the use of heavy analytical and experimental equipment, make Torrey Unit expecially well suited for limnological research in Oregon's High Cascades.

### Impacts on Other Resource Values

Timber: Timber resource values are low on this tract. The entire area is equivalent, at best, to Western Hemlock Site Class VI and, in many places, even poorer. Much of the proposed area is within the Waldo Lake Recreational Area, in the Pacific Crest Trail System corridor, or has some other aesthetic or recreationally-oriented constraint on timber harvest activities. Consequently, although some harvestable timber volume will be eliminated by the RNA, its effect on timber production is considered to be minimal. It is calculated that establishment of the natural area will reduce the allowable cut of the Willamette National Forest by ______ m board feet/year below that which would otherwise be available.

**Water**: Establishment of the RNA is expected to have a neutral effect on watershed values since disturbance will be minimized.

**Recreation**: Substantial recreational use of areas included within the RNA does occur and can be expected to continue in the future. It is confined to essentially two different types of users in the two units: (1) hikers on the Pacific Crest Trail and, to a lesser degree, associated trails circling Charlton Butte; and (2) fishermen visiting the larger lakes and ponds in the Torrey Unit.

Recreational use associated with the Pacific Crest Trail is confined to the immediate vicinity of the trail due to a lack of off-trail attractions and camping spots within the Research Natural Area. Consequently, hiker use of the trail, even in greatly expanded numbers, should have little significant impact. Restrictions on trail use are not planned although developments which would tend to increase the duration of a hiker's stay within the RNA will be avoided. Appropriate signing will be developed to advise the hikers of the reserved nature of the area they are passing through.

Recreational use of lakes in the western section of the RNA currently occurs at modest levels. Most of this is day use by fishermen visiting the lakes that are planted periodically. The current stocking program is presented in Table 3.

Table 3. Fish stocking record for the lakes within Torrey Unit, Torrey-Charlton Research Natural Area, Willamette National Forest.

| | Number of Fish Stocked Every Other Year | | |
|---|---|---|---|
| Lake | Brook Trout | Cutthroat Trout | Rainbow Trout |
| Torrey Lake | 5000 | 2000 | 2000 |
| Cervus Lake | 1500 | | |
| Priscilla Blake | | 250 | |
| North Torrey Lake | 1000 | | |

Impact on the lake-side vegetation is insignificant based upon examination during evaluation of the RNA. Restrictions on recreational use including the fish planting programs are not, therefore, anticipated in the near future. It is conceivable that restrictions on recreational use and/or alterations in fish planting programs will be considered in the future either because (a) recreational use is significantly altering the lake ecosystems or (b) cessation of fish planting is necessary for development of basic research programs on High Cascade lake limnology. The lakes within the RNA are expected to serve as the controls for research effectiveness and ecological impacts of recreational programs, including fish planting, on high lakes.

Any alterations in current fish management programs in the area would be developed coopratively by the Oregon Fish and Game Commission, Willamette National Forest, and the Pacific Northwest Forest and Range Experiment Station. Unilateral action to alter or restrict recreational uses, including fishing, could not and would not be considered. All parties are, therefore, going to have to concur on altering management programs which affect the scientific potential of the RNA.

Mineral: No mineral explorations are known to have occurred in the RNA. No mineralized bodies are known to exist there. The area will be withdrawn from mineral entry after establishment as an RNA.

## Protection and Management

The management objective within Torrey-Charlton RNA will be to maintain natural conditions for scientific study.

Roads and roadside strips: The 200-foot (61-m) buffer alongside roads adjacent to the RNA will not be developed in a way which would tend to increase use of the RNA by recreationists. Exceptions would be development of parking facilities at existing trailheads, should safety reasons warrant such.

Salvage of dead, down, or dangerous trees will be allowed along the adjacent roads for 100 feet (30.5 m) on the RNA side of the road. Only these types of trees will be logged. Logging will be by cable methods using the road as a landing.

Trails: Developments along trails in the RNA which would tend to increase the duration of a hiker's stay within the RNA will be avoided. Appropriate signing will be developed to advise hikers of the reserved nature of the area through which they are passing.

Proposed additions to the existing system of trails would be planned cooperatively by Willamette National Forest and the Pacific Northwest Forest and Range Experiment Station. The existing trails into Torrey Lake will remain unsigned.

Stocking of lakes: Any alterations in current fish management programs will be developed cooperatively by the Oregon Fish ad Game Commission, Willamette National Forest, and the Pacific Northwest Forest and Range Experiment Station.

Public use: No effort will be made to unilaterally prohibit recreational use of the RNA. Conflicts with research objectives will be evaluated on a case by case basis. Any restrictions on recreational use will be developed jointly by the Willamette National Forest and the Pacific Northwest Forest and Range Experiment Station.

Signs: In accordance with Region 6 standards, permanent boundary markers (7 x 10-inch metal Research Natural Area signs, GSA Cat. No. ____) will be posted along the boundary of the Research Natural Area at 200 feet (61 m) intervals. The project will be the responsibility of the Oakridge District Ranger, and funds for this operation will be requested after formal establishment of the RNA.

Mapping: The RNA boundary will be shown on the Planning Unit map for the Oakridge Ranger District.

Fire suppression: The use of chemical fire retardation is to be avoided, if possible, within the RNA. Water should be first considered if aerial suppression techniques are to be used.

Appendix I. A summary of collections made in the Torrey-Charlton Research Natural Area, Torrey Unit, on 14-16 September 1976.

By: Dr. Kenneth Cummins, Limnologist, Michigan State University,
East Lansing, Michigan.
Dr. James Sedell, Limnologist, Oregon State University,
Corvallis, Oregon.

The numbers in parentheses refer to the location of the lake or pond sampled.

I. Emphemeral Ponds (1)

A. Ponds which dry in spring. These early-drying ponds held little evidence of aquatic forms, although when water is present, interesting communities are probably present.

1. Phytoplankton. When water is present, at least motile flagellate algae.

2. Zooplankton. When water is present, probably Protozoa and Rotifera and possibly fairy shrimp (Branchipoda).

3. Benthos. A few inactive whirligig beetles (Coleoptera-Grinidae) were found in the dampest spots under logs.

B. Ponds which dry in summer. These late-drying ponds held aquatic insects in several stages in damp places under logs and rocks.

1. Phytoplankton. More diverse than A when water is present. Dried mats of filamentous green algae were observed.

2. Zooplankton. More diverse than A when water is present. Undoubtedly Protozoa, Rotifera and certain microcrustacea.

3. Benthos (in damp locations)
   - Insecta
     - Odonata
       - Anisoptera (dragonflies)
         - Libellulidae mymphs
       - Trichoptera
         - Lepidostomatidae (undet. adults)
         - Phryganeidae (undet. adults)
         - Limnephilidae
           - Lenarchus (eggs, and early instar larvae?) - probably passes the fall and winter primarily as eggs.
         - Coleoptera (beetles)
           - Gyrinidae (whirligig beetles)

## II. Shallow Ponds

### A. Elk Print Lake (2)

- Insecta
  - Odonata
    - Anisoptera
      - Libellulidae-nymphs
      - Aeschnidae-nymphs
  - Hemiptera
    - Notonectidae (back swimmers)
      - probably *Buenoa*-nymphs
  - Trichoptera
    - Phryganeidae
      - *Banksiola*-early instars
    - Limnephilidae
      - Halesochila -probably taylori
  - Coleoptera
    - Dytiscidae
      - *Bidessus*-adults
  - Diptera
    - Chironomidae (midges)
    - Chaoboridae (phantom midges)
      - *Chaoborus*
  - Oligochaeta

B. Pika Bog (3) - Dormant forms indicated by *

1. Phytoplankton
   - Chlorophyceae
     - Undet. filamentous and colonial greens
   - Desmidaceae
     - *Staurastrum*
     - Cosmarium
   - Diatoms
     - *Navicula*-type
     - *Cymbella*
     - *Gomphonema*
     - *Eunobia*
     - **Melosira*

2. Zooplankton
   - Copepoda (Copepods)
     - *Cyclopoida
   - Cladocera (water fleas, etc.)
     - *Bosmina*
     - *Chydorus*
3. Benthos
   - Insecta
     - Odonata
       - *Anisoptera
         - Libellulidae
         - Aeschnidae
       - Trichoptera
         - Limnephilidae
           - *H. taylori*? - larvae
             - Undet. early instar larvae

     - Coleoptera
       - Dytiscidae
         - probably Agabus-adults
       - Gyrinidae
         - *Gyrinus*-adults
       - Chrsomelidae
         - **Galerucella* - All life stages (on floating leaves of rooted aquatic plants)

         - Diptera
           - Chironomidae
   - Mollusca
     - Pelecypoda (clams)
       - Sphaeriidae (fingernail clams)
         - probably Pisidium

### C. O'er the Ridge Lake (4)

1. Phytoplankton
    - *Desmidaceae

2. Zooplankton
    - Rotifera
        - *Keratella cochlearis*
        - *Polyarthra*
        - *Conochilus unicornis*
    - Copepoda
        - *Diaptomus*
    - Cladocera
        - *Holopedium*
3. Benthos
    - Insecta
        - Trichoptera
            - Limnephilidae
                - *H. tayloria*?-larvae
            - Leptoceridae-undet. larvae
        - Coleoptera
            - Chrysomelidae
                - **Galerucella*-all stages

## D. Pond 2 (5)

1. Phytoplankton
    - Desmidaceae
        - _Triplocerus_
    - Diatoms
2. Zooplankton
    - Protozoa
        - undet. ciliates
    - Rotifera
        - *_K.cochlearis_
        - _Polyarthra_
3. Benthos
    - Insecta
        - Odonata
            - Anisoptera
                - Aeschnidae-nymphs
                - Libellulidae-nymphs
            - Emphemeroptera (mayflies)
                - Baetidae
                    - _Callibaetis_
            - Hemiptera
                - Notonectidae
                    - _Notonecta_-nymphs
                - Gerridae
                    - Gerris-adults
            - Megaloptera (helgramites, etc.)
                - Sialidae (alder flies)
                    - _Sialis_ probably _rotunda_-larvae
                - Trichoptera
                    - Phryganeidae
                        - _Banksiola_ _crotchi_-larvae
                        - _Agryonia_ improba-larvae
                - Diptera
                    - Chironomidae
                    - Chaoboridae
                        - _Chaoborus_
    - Mollusca
        - Pelecypoda
            - Sphaeriidae
                - _Pisidium_?

## III. Lakes

- A. North Torrey Lake (6)
  - 1. Phytoplankton
    - Demidaceae
  - 2. Zooplankton
    - Rotifera
      - _C. unicornis_?
    - Copepoda
      - *_Diaptomus_
    - Cladocera
      - _Bosmina_
      - _Daphnia_
  - 3. Benthos
    - Insecta
      - Odonata
        - Anisoptera
          - Aeschnidae
        - Zygoptera (damselflies)
          - *Coenagrionidae
        - Ephemeroptera
          - Baetidae
            - _Callibaetis_-nymphs
    - Megaloptera
      - Sialidae
        - _S. rotunda_?-larvae
    - Trichoptera
      - Phryganeidae
        - _B. crotchi_-early instar larvae
      - Leptoceridae
        - Mystacides alafimbriata-early instar
      - Limnephilidae
        - probably _Clistoronia_, _Halesochila_ early instar larvae

  - Amphipoda
    - Gammaridae

B. Let's Wait Lake (7)

1. Phytoplankton
    - Chlorophyceae
        - undet. colonial and filamentous forms
    - Desmidaceae
        - *_Cosmarium_
    - Diatoms
        - undet. pennate forms
2. Zooplankton
    - Rotifera
        - *_K. cochlearis_
        - _Asplanchana_
        - _Polyarthry_
    - Copepoda
        - _Diaptomus_
        - Cyclopoida
    - Cladocera
        - _Chydorus_
3. Benthos
    - Insecta
        - Odonata
            - Anisoptera-undet. adults
        - Trichoptera
            - Phryganeidae
                - _B. crotchi_-larvae
            - Limnephilidae
                - *_H. taylori_-larvae
                - undet. larvae
        - Coleoptera
            - Chrysomelidae
                - _Galerucella_
        - Diptera
            - Chironomidae
            - Chaoboridae
                - _Chaoborus_

C. Priscilla Lake (8)

1. Phytoplankton
    - Chlorophyceae
        - *undet. colonial and filamentous forms
    - Desmidaceae
        - Arthrodesmus
    - Diatoms
        - Navicula
        - Melosira
        - Synedra
        - Cymbella
        - Eunotia
2. Zooplankton
    - Rotifera
        - *K. cochlearis
        - *C. unicornis
            - Polyar thra vulgaris
            - Collotheca pelagica
    - Copepoda
        - Diaptomus
    - Cladocera
        - Holopedium

3. Benthos

- *Porifera-undet. erect sponges
- Insecta
  - Odonata
    - Anisoptera
      - Libellulidae
        - *Cordulia*?
      - Aeschnidae
        - *Aeschna*?
  - Zygoptera
    - Coenagrionidae
      - *Enallagma*
  - Ephemeroptera
    - Baetidae
      - *Callibaetis*
  - Megaloptera
    - Sialidae
      - *S. rotunda*
  - Trichoptera
    - Phryganeidae
      - *A. improba*-larvae
    - Limnephilidae
      - Halesochila-early instar larvae
      - undet. larvae
    - Leptoceridae
      - *Oecetis*-larvae
      - *M. alafimbriata*-larvae
  - Coleoptera
    - Dytiscidae
      - prob. *Hydaticus*-larvae
    - Diptera
      - Chironomidae-larvae
      - Chaoboridae
        - Chaoborus-larvae

Mollusca

- Pelecypoda
  - Sphaeriidae
    - *Pisidium*?

D. Cervus Lake (9)

1. Phytoplankton-not sampled
2. Zooplankton
    - Copepoda
        - _*Diaptomus_
3. Benthos
    - Porifera-undet. erect sponges
    - Insecta
        - Odonata
            - Anisoptera-nymphs
        - Ephemeroptera
            - Baetidae
                - _*Callibaetis_-nymphs
        - Megaloptera
            - Sialidae
                - _S. rotunda_-larvae
        - Trichoptera
            - Phryganeidae
                - _B. crotchi_
            - Limnephilidae
                - undet. early instar larvae
        - Diptera
            - Chironomidae-larvae
            - Chaoboridae
                - Chaoborus-larvae

E. Torrey Lake (10)

1. Phytoplankton
    - Chlorophyceae
        - *undet. colonial greens
    - Diatoms
        - Navicula
        - _Gomphonema_
        - _Cymbella_
        - _Pinnulcuria_
2. Zooplankton
    - Copepoda
        - _*Diaptomus_
    - Cladocera
        - _Daphnia_
        - _Bosmina_

3. Benthos

- Porifera-undet. erect and prostrate sponges
- Insecta
  - Odonata
    - Anisoptera
      - Aeschnidae-nymphs
      - Libellulidae-nymphs
        - prob. Cordulia
    - Hemiptera
      - Gerridae
        - Gerris (_remigis?_)-adults
    - Ephemeroptera
      - Baetidae
        - *_Callibaetis_-nymphs
    - Megaloptera
      - Sialidae
        - _S. rotunda_-larvae
    - Trichoptera
      - Limnephilidae
        - _Halesochila_-early instar larvae
        - *undet. early instar larvae
      - Leptoceridae
        - _M. alafimbriata_-larvae
      - Coleoptera
        - Chrysomelidae
          - _Bonacia_-larvae and pupae in roots of sedges, adults on emergent plants
        - Gyrinidae
          - _Gyrinus_
      - Diptera
        - Chironomidae
        - Chaoboridae
          - _Chaoborus_
    - Amphipoda
      - Gammaridae
    - Hiruninea
      - Glossophonidae

Table 1. Summary of Soil Characteristics for Torrey-Charlton Research Natural Area. 1/

| | Soils of Plateau Portion of RNA | | Soils of Butte in RNA |
|---|---|---|---|
| Approximate percent of area | 55 | 30 | 60, remainder mostly roc |
| Depth to rock | 50" to 70" | 20" to 36" | 48" to 60" |
| Soil texture and thickness | | | |
| Surface | Loamy sand, sandy loam 1" to 5" | Loamy sand, 1" to 4" | Loamy sand 1" and 3" |
| Subsoil | Loamy sand, sand, 10" to 14" | Very pumiceous loamy Sand, 12" to 20" | Loamy sand, sandy loam 10" to 12" |
| Buried soil | Cobbly loam, cobbly sandy loam, 30" to 40" | Cobbly and stony loam, 12" to 18" | Gravely sandy loam 10" to 12" |
| Substratum | | | Cindery sand 30" to 40" |
| Parent material | Pumice over andesitic glacial till | Pumice over andesitic glacial till | Pumice over andesitic glacial till over cinder |
| Drainage | Surface soil, excessive buried soil; well | Excessive | Excessive |
| Infiltration | Slow to moderate | Slow | Moderate |
| Depth of nonwettable surface | 0.5" to 3.0" | 0.5" to 3" | 0 to 0.25" |
| Percolation | Moderate | Moderate | Moderate to rapid |
| Water storage capacity | | | |
| Detention | 2.15" | 2.20" | 1.40" |
| Retention | 5.31" | 2.82" | 2.86" |
| Humus type | | | |
| Natural | Feltry mor, 1" to 3" | Thin mull, 0.75" to 1.25" | Medium mull, 0.25" to 1. |
| Fire | Medium mull, less than 1" | Medium mull, 0.25 to 0.50" | Medium mull, less than 0 |

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1/ Data from an unpublished manuscript by Mr. Lew Manhart, on file at the Supervisor's Office, Willamette National Forest, Eugene, Oregon.

# ESTABLISHMENT REPORT
# FOR THE PROPOSED
# WECHEE BUTTE RESEARCH NATURAL AREA
# DESCHUTES NATIONAL FOREST

## Principal Distinguishing Features

The Wechee Butte Research Natural Area (RNA) is located in the Central Oregon pumice plateau, an area of numerous small cinder cones, extensive pumice deposits, and young lava flows. The RNA contains approximately 360 acres of lodgepole (*Pinus contorta*) and ponderosa pine (*Pinus ponderosa*) forests, of which nearly 300 acres is occupied by Wechee Butte (Figure 7). Wechee Butte is a totally undisturbed, entirely forested cinder cone. The northern rim of the cone rises 300 feet above the general terrain and is breached to the northwest. The crater is approximately 120 feet below the northeast rim of the cone and 10 feet below the southwest rim.

Antelope-bitterbrush (*Purshia tridentata*) associations predominate as pole stands throughout most of the area, and as lodgepole thickets on the northeast slope of the cinder cone. At midslope on east and west exposures the lodgepole forest grades into a ponderosa-manzanita (*Arctostaphylos patula*) community, with nearly pure ponderosa pine stands occurring on the south slopes and on the crater rim. The crater itself is occupied by pole size (6-8 inch) lodgepole pine in contrast to the open ponderosa pine community on the south rim 20 feet away. On the north side of the cone at midslope is an area in which lodgepole, ponderosa pine, whitebark pine (*Pinus albicaulis*), and white fir (*Abies concolor*) may be found together. The herbaceous layer throughout the RNA is sparse. Gradual changes in plant community types may be observed with variations in percent slope and soil type as the butte is ascended, and with changing slope aspects on the cone as it is circumnavigated.

Surface soils range from sandy loam to red cinders, with a few outcroppings of volcanic bedrock. Slopes vary from 5 to 10 percent surrounding the butte, to as much as 40 percent near the crater rims. The proposed area is heavily used summer mule deer range and is reproductive habitat for 72 species (Table 3 - Hypothetical List) of terrestrial vertebrates.

## Justification

The Wechee Butte RNA fills a high priority need identified by the Pacific Northwest Natural Area Committee in 1973. It fills the need for an undisturbed, entirely forested cinder cone, and would provide the first representation of this cell in Planning Area 4. The varying topography of the cinder cone and surrounding land creates several microclimates and environmental gradients, adding to the inherent diversity of the area. The RNA primarily presents a comparison of lodgepole and ponderosa pine communities on different soils, slopes, and aspects, within a small area.

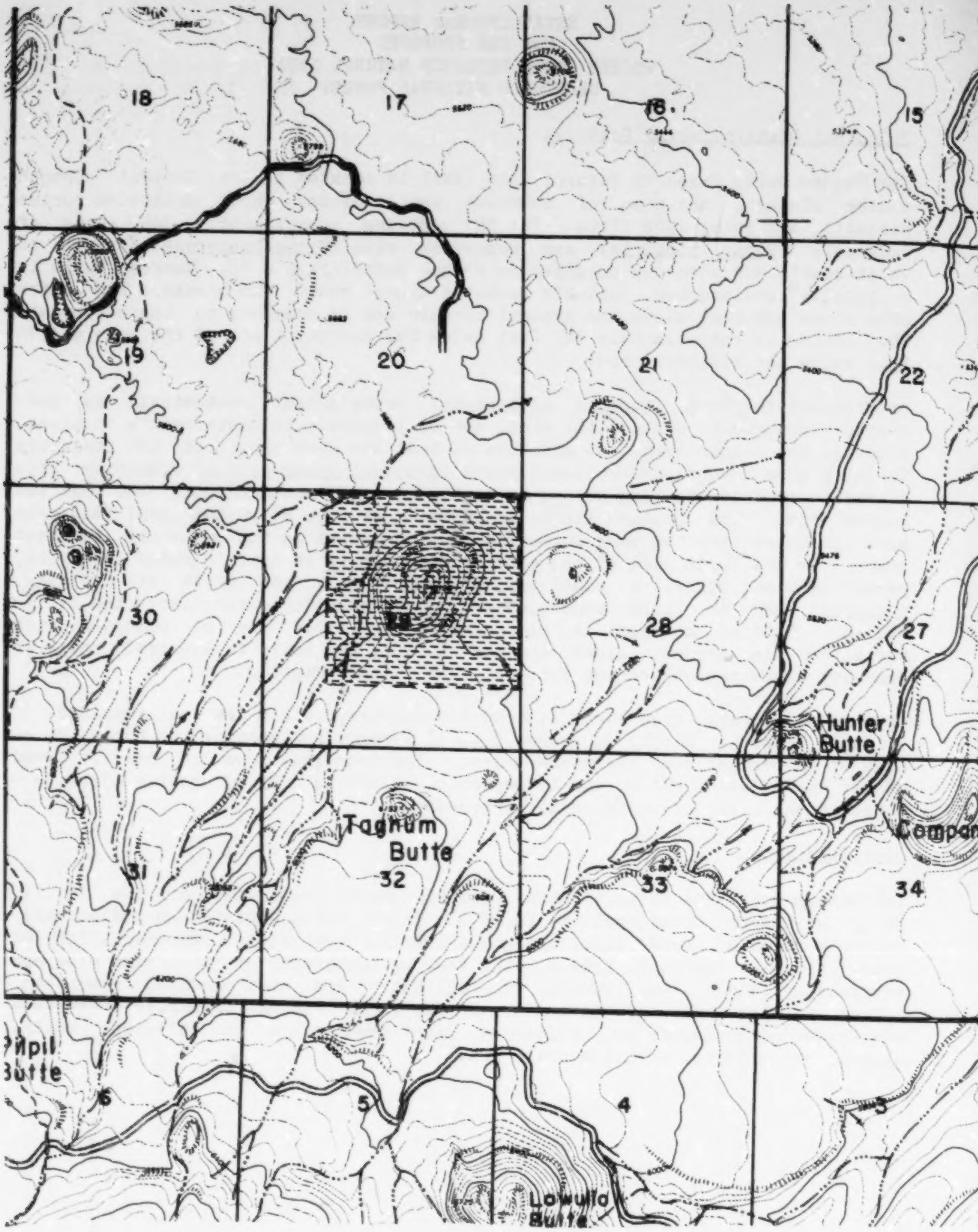
18
17
16
15
19
20
21
22
30
29
28
27
Hunter Butte
Taghum Butte
31
32
33
34
Compan
Pipil Butte
6
5
4
3
Lowulo Butte

Figure XXX

The south side of the cone and the crater rims are the driest sites in the RNA, and it is here that nearly pure stands of ponderosa pine are found. The surface soil in this area is coarse red cinders with a scant herbaceous layer, and a shrub layer of manzanita and bitterbrush. Numerous large ponderosa pines are found here, up to 100 feet in height and 36 inches DBH. The crater supports a dense pole stand of lodgepole pine in sharp contrast to the widely spaced ponderosa pine on the rims bordering the crater. This situation may be attributed to cold air drainage into the crater forming a frost pocket and subsequent top or climax of lodgepole. The north slope of the cone is the most moist area in the RNA and supports a unique mixture of species within the tract. In order of abundance, the important species found here are lodgepole pine, ponderosa pine, whitebark pine and white fir in the overstory, sticky current (*Ribes viscosissimum*) in the shrub layer, and broadpetal strawberry (*Fragaria virginiana*) plus three species of *Pyrola* as common herbs. Adding to the diversity of the RNA is the gradual change from climax pole stands of lodgepole pine with very little shrub layer on the relatively flat land around the butte, to climax ponderosa pine with seral lodgepole and a manzanita and bitterbrush shrub layer at the summit of the cinder cone.

Wechee Butte is in the midst of typical commercial forest land. At this time there is no stand disturbance in the proposed area, no evidence of past logging, roadbuilding, or recent fires. There are active timber sales within a mile of the butte, and several more are planned. Many public pole cutting areas are located with a few miles of the RNA on access road 1915B. The multiple use designation for the area is wood/forage.

The Wechee Butte RNA provides an opportunity to study ponderosa and lodgepole pine together in a natural setting with a variety of volcanic soils, aspects, slopes, and resultant microclimates. Studies might include comparison of dominance of the two species on different sites, dry sites, immature soils or the effects of soil moisture on each species. The abundance of dwarf mistletoe (*Arceuthobium americanum*) in many of the climax lodgepole stands suggests research possibilities involving the pathogen. Additional research might involve comparisons of the edaphic climax of ponderosa pine and the topoedaphic climax of lodgepole pine in the RNA.

### Location

The proposed Wechee Butte Research Natural Area occupies approximately (unless its been surveyed) 360 acres in the Deschutes National Forest, at North Latitude 43°49', West Longitude 121°13'. The tract is located in Deschutes County, 17 air miles south-southeast of Bend, Oregon. It is accessible only by foot and no trails exist at this time. The nearest road is No. 0304, a primitive forest road 1/2 mile to the north of the RNA boundary. The RNA is located in NE1/4, E1/2NW1/4, N1/2SE1/4 and NE1/4SW1/4 of sec. 29, T. 20 S., R. 13 E., W.M.

### Community Types

Forest composition within the RNA changes with slope, aspect, topography and soil type. These factors affect the amount of moisture available for plant use, and the temperature range to which the plants are subjected. Changes in the forest communities are apparently closely related to the moisture holding capacity of the soils and minimum night-time temperatures during the growing season.

The Central Oregon Pumice Zone is known for its forests composed solely of lodgepole and ponderosa pine. These trees have developed on immature, coarse-textured and droughty pumice soils. Tree species, in order of abundance in the RNA, are lodgepole pine, ponderosa pine, whitebark pine, and white fir. Lodgepole constitutes approximately 80 percent of all trees, ponderosa pine about 20 percent, whitebark pine 1 percent, and white fir less than 1 percent. Lodgepole appears to be the major climax species throughout the tract, based on reproductive success. Ecologically, the communities encountered in the Wechee Butte RNA are typical of the _Pinus ponderosa_ and _Pinus contorta_ Zones of the pumice plateau of south-central Oregon[1]. These zones are characterized by a short growing season, low summer precipitation and wide diurnal temperature fluctuations. Lodgepole stands are generally situated on nearly level terrain or in depressions where cold air drainage from surrounding slopes produces substantially lower nighttime temperatures. In these situations, where the soil is well drained, lodgepole is considered to be a topoedaphic climax due to its greater resistance to low temperatures. Ponderosa pine occupies drier sites than lodgepole and often does better on coarse textured or sandy soils than on finer soils. Studies indicate that the distribution of ponderosa pine is closely correlated with available soil moisture, soil texture, and temperature.

Three plant community types are represented in the RNA and can be correlated to Volland's types[2] as follows:

| Unit | Plant Community | Location | Acreage |
|---|---|---|---|
| 1 | Lodgepole/bitterbrush needlegrass CL-S2-11 | Flats surrounding butte, lower 2/3 of east slope, lower 1/3 of west slope | 310 |
| 2 | Lodgepole/currant-bitterbrush/needlegrass CP-S2-15 | North slope of butte | 10 |
| 3 | Ponderosa/bitterbrush-manzanita/needlegrass CP-S2-13 | Rim of crater, south side of butte, top 1/3 of east slope, top 2/3 of west slope | 40 |

[1] Franklin, Jerry F. and Dyrness, C.T., _Natural Vegetation of Oregon and Washington_, U.S. Government Printing Office, Washington, D.C., 1973, 417 pages, illustrated.

[2] Volland, Leonard A., _Plant Associations of the Central Oregon Pumice Zone_, U.S.D.A. Forest Service Pacific Northwest Region, Port- land, Oregon, September, 1982. R6-Ecol-104-1982. 122 p.

Unit 1 is occupied by the Lodgepole/bitterbrush/needlegrass community. This climax lodgepole forest is found in the relatively flat areas of the RNA surrounding the butte and in the crater, with slopes from 5 to 10 percent, and on the lower 2/3 on the east side and the lower 1/3 on the west side of the cinder cone, with slope up to 35 percent. This unit includes approximately 200 acres of the RNA. In the flats surrounding the cone, lodgepole has an average basal area of 100 feet$^2$/acre. In this type of area the lodgepole forest occurs as an all-age stand, with an average stem size of 60 feet in height, 10 inches DBH, the largest reaching 100 feet in height, 14 inches DBH. There are scattered large ponderosa pines throughout the unit, the largest measuring 100 feet tall, 40 inches DBH, and occupying up to 30 feet$^2$/acre. A small amount of ponderosa and whitebark pine is present as regeneration up to 20 feet in height. No mature whitebark pine have been located in the RNA. The shrub layer in this community is dominated by bitterbrush which has been hedged by deer, much of which has died out. Squaw currant is scattered throughout the unit and there is very little herbaceous vegetation. Broadpetal strawberry is the dominant herb with other common but sparse understory species being tailcup lupine (*Lupinus caudatus*), western yarrow (*Achillia millefolium*), fireweed (*Epilobium angustifolium*), princess-pine (*Chimaphila unbellata*), bottlebrush squirreltail (*Sitanion hystrix*), and long-stolon sedge (Carex pensyl-vanica). In the thickets in the north-eastern portion of the unit, the basal area of lodgepole increases to 140 feet$^2$/acre, on slopes up to 25 percent. Stems average 40 feet in height, 5 inches DBH, with the largest measuring 60 feet, 8 inches DBH. Understory vegetation is identical to that just described, but less abundant. The lower 2/3 of the east slope of the butte has a near co-dominance of ponderosa pine with lodgepole about midslope, a large quantity of dead manzanita, and almost no herbs present. The crater supports a dense pole stand of lodgepole averaging 60 feet tall and 8 inches DBH, up to 110 feet, 12 inches DBH. A few large ponderosa pines occur in the crater, no shrub layer exists, and dominant understory species are broadpetal stawberry and Nevada bluegrass (*Poa neva-densis*). On the lower third of the west side of the butte, on a 35 percent slope, ponderosa and whitebark pine are found only as regeneration. There is no shrub layer and common herbs are dominated by broadpetal strawberry, with princespine, tailcup lupine, Holboell rockcress (*Arabis holboellii*), and broadseed rockcress (*Arabis platysperma*) also present.

In Unit 2 a slightly different lodgepole community occurs on the moist north side of the butte, on a slope of 30 to 35 percent. In this lodgepole/currant-bitterbrush/needlegrass community lodgepole has a basal area of 110 feet$^2$/acre, average tree height of 60 feet, average DBH 6 inches, with the largest 70 feet tall, 9 inches DBH. A few ponderosa pines of all ages are present with the largest reaching 100 feet in height and 30 inches DBH. In addition, there are a few whitebark pine saplings, and one grand fir about 50 feet in height and 8 inches DBH has been found. Bitterbrush is absent and the only shrub component is sticky currant, which is found nowhere else in the RNA. Broadpetal strawberry is dominant in the herbaceous layer over a few princespine and fireweed. Also unique to this unit are three woods wintergreen species, *Pyrola dentata*, *Pyrola picta*, and *Pyrola secunda*.

The ponderosa/bitterbrush-manzanity/needlegrass community of Unit 3 is found on the rim and the south slope of the cinder cone, the top 1/3 of the east slope, and the top 2/3 of the west side of the butte with slopes up to 30 percent. On the crater rim the basal area of ponderosa pine ranges from 80 $feet^2$/acre on the south rim to 120 $feet^2$/acre on the northeast rim. All ages of ponderosa are represented with a few pole-sized lodgepole also present. It is here on the summit of the butte that numerous ponderosa pines are prevalent in the range of 100 feet in height and 36 inches DBH. Many of these large trees have broken or dead tops and multiple stems. The shrub layer in this area is composed entirely of greenleaf manzanita and antelope bitterbrush, with the bitterbrush varying from weak subordinate to strong co-dominate. Common herbs are small-flowered blue-eyed mary (Collinsia parviflora), dwarf purple monkey-flower (Mimulus nanus), and Nevada bluegrass. The east and west slopes of the cone have very little understory and a large amount of dead manzanita. Lodgepole pine becomes more common as the cinder cone is descended, reaching co-dominance with ponderosa and then becoming dominant with bitterbrush again near the base of the butte.

The Wechee Butte Research Natural Area falls within Kuchler's[3].

It is also included in the SAF Cover Type[4].

## Physical and Climatic Conditions

The Wechee Butte RNA is occupied by a 200-acre cinder cone in the midst of gently sloping lodgepole forest. All aspects are represented on the cone, and the surrounding land has a slight northeasterly incline. Slopes range from 5 to 40 percent with the sides of the cone between 25 and 40 percent. Elevation is approximately 5800 feet (1769 meters) surrounding the butte and 6138 feet (1872 meters) at the highest point on the cinder cone.

The climate of central Oregon is typified by cold winters, hot summers, a short growing season, and low annual precipitation. Wide diurnal temperature fluctuations of 10°C to 16°C are common. The summers are very dry and a high proportion of annual precipitation falls as snow. The nearest weather record is at Pine Mountain Observatory, 13 miles to the east of the RNA. The data in Table 2 is an average of the 10-year period from 1968 to 1978 from Pine Mountain.

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[3] Kuchler, A.W. Potential Natural Vegetation of the Conterminous United States, American Geographical Society, Special Publication Number 36, illustrated.

[4] Society of American Foresters, Forest Cover Types of North America, Exclusive of Mexico, Society of American Foresters, Washington, D.C., 1954, 67 pages, illustrated.

## Protection and Management

See direction in Forest Plan for Research Natural Areas.

Table 1. Tentative list of vascular plants
Wechee Butte Research Natural Area

| | Scientific Name | Common Name |
|---|---|---|
| TREES | Abies concolor | White fir |
| | Pinus albicaulis | Whitebark pine |
| | Pinus contorta | Lodgepole pine |
| | Pinus ponderosa | Ponderosa pine |
| SHRUBS | Arctostaphylos patula | Greenleaf manzanita |
| | Chimaphila umbellata | Princespine |
| | Purshia tridentata | Antelope bitterbrush |
| | Ribes cereum | Squaw currant |
| | Ribes viscosissimum | Sticky currant |
| GRASSES | Festuca idahoensis | Idaho fescue |
| | Poa nevadensis | Nevada bluegrass |
| | Sitanion hystrix | Bottlebrush squirreltail |
| | Stipa occidentalis | Western needlegrass |
| SEDGES | Carex pensylvanica | Long-stolon sedge |
| | Carex rossii | Ross sedge |
| FORBS | Achillea millefolium | Western yarrow |
| | Arabis holboellii | Holboell rockcress |
| | Arabis platysperma | Broadseed rockcress |
| | Chryptantha ambigua | Obscure chryptantha |
| | Collinsia parviflora | Small-flowered blue-eyed mary |
| | Epilobium angustifolium | Fireweed |
| | Eriogonum umbellatum | Sulfur buckwheat |
| | Erysimum asperum | Rough wallflower |
| | Fragaria virginana | Broadpetal strawberry |
| | Lupinus caudatus | Tailcup lupine |
| | Mimulus nanus | Dwarf purple monkey-flower |
| | Montia perfoliata | Miner's lettuce |
| | Penstemon humilis | Low penstemon |
| | Phacelia hastata | Whiteleaf phacelia |
| | Pterospora andromedea | Woodland pinedrops |
| | Pyrola dentata | Toothleaf pyrola |
| | Pyrola picta | Whitevein pyrola |
| | Pyrola secunda | Sidebells pyrola |

Table 2. Average temperature and precipitation at Pine Mountain Observatory. Based on average of years 1968 to 1978.

| | Temperature (°F) | Precipitation (Inches) |
|---|---|---|
| Average annual | 40.6 | 11.78 |
| Average January | 26.6 | ---- |
| Average July | 61.0 | ---- |
| Average June-August | --- | 0.84 |

## TIMBER RESOURCES:  WECHEE BUTTE RNA

The existing timber resources are best described as a composite of "stands." The 1978 stand mapping and classification project included all Proposed Research Natural Area's and is used as the basic description of Timber Resources.

Weechee Butte RNA
See Map - Figure 5

## STANDS WITHIN RESEARCH NATURAL AREA - DESCRIPTION

| | | Overstory | | | | | Understory | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Stand | Acres/% Within RNA | Species | Maturity | Size | Volume | Stock | Species | Maturity | Size | Volume | Stock |
| CW | 15/6.5 | Lodgepole<br>Ponderosa | Mature | All Types | 3<br>52M | E | Lodgepole<br>Ponderosa | Immature | Seedl.<br>Sapl.<br>Poles,<br>Small Sawlogs | 1 | EL |
| CS | 45/19.4 | Lodgepole | Mature | Poles,<br>Seedlings<br>Saplings<br>Small Sawlogs | 1<br>45M | E | Lodgepole | Mature | Seed. & Sapl. | - | LE |
| EL | 20/8.6% | Lodgepole | Mature | Poles<br>Small Logs,<br>Seedlings & Saplings | 1<br>20M | E | Lodgepole | Immature | Poles<br>Seedl. & Sapl. | - | L |
| CX | 3/1.3 | Lodgepole<br>Ponderosa | Immature | Poles<br>Small Logs,<br>Seedling & Saplings | 1<br>3M | EL | - | - | - | - | - |
| CT | 25/10.8 | Ponderosa<br>Lodgepole | Mature | Poles,<br>Large & Small Sawlogs | 15<br>375M | SL | Ponderosa<br>Lodgepole | Immature | Seedl.<br>Suppl.<br>Large Sawlogs,<br>Poles | 3 | L |

### Volume Codes

| | |
|---|---|
| 1=0 to 2M Bd. Ft. | 1 |
| 3=2M to 5M Per Acre | 3.5 |
| 7=5M to 10M | 7.5 |
| 15=10M to 20M | 15.0 |
| 25=20M to 30M | 25.0 |
| 35=30M+ | 30.0 |

### Stocking Codes

E = Excessive
S = Satisfactory
L = Low
EL = Clumpy - 50% Stocked
LE = Clumpy - 50% Stocked

Weechee Butte RNA
See Map - Figure 5

## STANDS WITHIN RESEARCH NATURAL AREA - DESCRIPTION

| | | Overstory | | | | | Understory | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Stand | Acres/% Within RNA | Species | Maturity | Size | Volume | Stock | Species | Maturity | Size | Volume | Stock |
| AG | 35/15.1 | Lodgepole<br>Ponderosa | Mature | Poles<br>Seedlings<br>& Saplings<br>& Small &<br>Large Logs | 3<br>122M | E | Lodgepole | Immature | Seedl.<br>& Sapl. | - | EL |
| BP | 4/1.7 | Lodgepole | Mature | Small Saw-<br>logs, Poles<br>Seedlings &<br>Saplings | 3<br>14M | EL | - | - | - | - | - |
| BQ | 2/.9 | Lodgepole<br>Ponderosa | Mature | Poles<br>Small<br>Sawlogs<br>Seedlings<br>& Saplings | 1<br>2M | E | Lodgepole<br>Ponderosa | Immature | Poles<br>Seedl.<br>& Sapl. | - | EL |
| CU | 20/8.6 | Ponderosa | Mature | Large<br>Sawlogs<br>Small<br>Sawlogs<br>& Sapl. | 25<br>500M | SL | Ponderosa | Immature | Small<br>Sawlogs,<br>Poles,<br>Seedl.<br>& Sapl | 3 | LE |
| CV | 30/13 | Ponderosa | Mature | Large &<br>Small<br>Sawlogs | 1<br>30M | L | Ponderosa<br>Lodgepole | Immature | Poles<br>Small<br>Sawlogs,<br>Seedl.<br>& Sapl | 1 | E |

Volume Codes

| | |
|---|---|
| 1=0 to 2M Bd. Ft. | 1 |
| 3=2M to 5M Per Acre | 3.5 |
| 7=5M to 10M | 7.5 |
| 15=10M to 20M | 15.0 |
| 25=20M to 30M | 25.0 |
| 35=30M+ | 30.0 |

Stocking Codes

E = Excessive
S = Satisfactory
L = Low
EL = Clumpy - 50% Stocked
LE = Clumpy - 50% Stocked

Weechee Butte RNA
See Map - Figure 5

## STANDS WITHIN RESEARCH NATURAL AREA - DESCRIPTION

| | Acres/% | Overstory | | | | | Understory | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Stand | Within RNA | Species | Maturity | Size | Volume | Stock | Species | Maturity | Size | Volume | Stock |
| CQ | 8/3.4 | Lodgepole | Mature | Poles<br>Seedl.<br>& Sapl.,<br>Small<br>Sawlogs | 1<br>8M | E | - | - | - | - | - |
| JN | 25/10.8 | Ponderosa<br>Lodgepole | Mature | Large<br>Small<br>Sawlogs | 15<br>375M | E | Ponderosa<br>Lodgepole | Immature | Seedl.<br>& Sapl.,<br>Small<br>Sawlogs,<br>Poles | 3 | EL |

12 Timber Stands
Approximately 232 Acres

1.546 MBF

1=0 to 2M Bd. Ft.
3=2M to 5M Per Acre
7=5M to 10M
15=10M to 20M
25=20M to 30M
35=30M+

Mature Timber

E = Excessive
S = Satisfactory
L = Low
EL = Clumpy - 50% Stocked
LE = Clumpy - 50% Stocked

# APPENDIX G

2820 Geothermal
Forest Service
7/19/85

## Special Stipulations
## DESCHUTES National Forest

The lessee shall comply with the following special conditions and stipulations unless they are modified by mutual agreement of the lessee, the authorized officer of the Bureau of Land Management, and the authorized representative of the United States Department of Agriculture, Forest Service.

a. All surface disturbing operations, other than "casual use" as defined by 43 CFR 3209.0-5(d), must be culturally cleared by the authorized representative of the Forest Service. When a lessee' cultural report is necessary to comply with standard lease term No. 6, it must be signed and certified by a qualified archaeologist acceptable to the authorized representative of the Forest Service.

b. The lessee shall make every possible effort to prevent, control, and suppress any fire on federally owned or managed lands or near the lease operational site. All uncontrolled fires shall be immediately reported to Forest Dispatch 548-6011 or COMMERCE 9903.

c. Prior to submission of a plan of operation for surface disturbing operations, the lessee shall meet with the authorized representative of the Forest Service, to be apprised of specific requirements, restrictions, administrative rules and regulations; e.g. timber sales, special use permits, experimental studies, contracts, grazing, and resource closures. This meeting may be waived if the Lessee is sufficiently aware of local problems and ground rules of the area involved in the proposed operation.

2 ____ The leased lands may be in an area suitable for the habitat of threatened or endangered plant or animal species. All known viable habitat of these species will be identified for the lessee by the authorized officer of the BLM or the authorized repesentative of the Forest Service at the pre-operational conference or field inspection with recommended mitigation measures. These may include (1) on-site biological and/or botanical surveys by authorities acceptable to the surface manager, (2) avoidance, or (3) lessee recommendation of programs complying with the provisions of the Endangered Species Act of 1973 as amended.

3 ____ In order to protect ________________________________________ the ________________________________________ lessee agrees not to occupy or use the surface of the following described lands unless this stipulation is modified or eliminated.

Willamette Meridian, ______________________________
________________________________________
________________________________________
________________________________________

4 _____

In order to protect ______________________________________________ ______________________________________the lessee agrees not to occupy or use the surface of the following described lands except for certain limited use as authorized in writing by the authorized representative of the Forest Service unless this stipulation is modified or eliminated.

Willamette Meridian, ______________________________
____________________________________________________
____________________________________________________
____________________________________________________
____________________________________________________

5 _____

No occupancy or other surface disturbance will be allowed on the following described lands on slopes in excess of 50 percent or on designated unstable/very unstable land types without written permission from the Deputy State Director for Mineral Resources, BLM with the concurrence of the authorized representative of the Forest Service.

Willamette Meridian, ______________________________
____________________________________________________
____________________________________________________
____________________________________________________
____________________________________________________

6 _____

In order to protect ______________________________________, the lessee shall not occupy or use the surface of the following described lands unless the lessee can demonstrate, by appropriate plan of operation to the satisfaction of the Deputy State Director for Mineral Resources, BLM and the authorized representative of the Forest Service, that this area will not be adversely affected by the proposed activities.

Willamette Meridian, ______________________________
____________________________________________________
____________________________________________________
____________________________________________________
____________________________________________________

7 _____

On the following described lands, ____________________________, exploration and development operations, such as drilling and associated activities, will not be allowed except from ________________ to ______________________________ unless specifically approved in writing. Routine inspection, maintenance, and servicing of producing wells and facilities may be excepted.

Willamette Meridian, ______________________________
____________________________________________________
____________________________________________________

8 ____ No permanent facilities such as power plants are allowed on the following described land unless this stipulation is modified or eliminated. Roads, drill pads, transmission lines, and pipelines are permitted.

Willamette Meridian, ______________________________

______________________________

______________________________

______________________________

______________________________

9 ____ Operations adjacent to any surface water or wet soil areas, such as streams, springs, seeps, reservoirs, or meadows, will require a buffer zone. The size will be specifically identified by the Deputy State Director for Mineral Resources, BLM and the authorized representative of the Forest Service.

10 ____ Except for water rights associated with the lease, the lessee will not remove water from any reservoir, spring, or well on the leased land without written permission.

11 ____ The lessee in accepting this lease acknowledges having read the attached Information Notices and is aware that the concerns addressed in such Notices will require special consideration by all parties at the time specific operations are proposed on the leased lands. Additional information on any of the Notices is available from the authorized representative of the Forest Service.

12 ____ The lessee, in accepting this lease acknowledges that all, or portions of the surface of the leased lands are privately owned. Lessee operations are subject to provisions of the ______________________________

______________________________

______________________________.

# APPENDIX H

# APPENDIX H
# SOCIAL EFFECTS OF ALTERNATIVES

## AREA OF INFLUENCE

This area has been defined as that area where almost all of the social effects of the Alternatives would occur -- specifically:

1. Deschutes County.
2. Those communities in adjacent Counties which are affected by management decisions.
3. Those people in Willamette Valley communities who are affected by and concerned with Deschutes management decisions.

The Social Effects Work Group divided the Area of Influence into four sub-areas for analyzing social effects. These four sub-areas were seen as characterizing the four principal community types in the Area of Influence as defined by their social and economic relationships with the Deschutes National Forest. The description of these community types and a discussion of recent social and economic trends and conditions was presented in Chapter III. The sub-areas are shown below.

| Sub-Area | Typified By |
|---|---|
| Central Oregon Urban Center | Bend |
| Rural Recreation and Residential Based Communities | Sisters, LaPine, Metolius River area, Upper Deschutes River area |
| Rural Industrial Communities | Gilchrist, Redmond, Prineville, Crescent |
| West Side Communities | Eugene, Portland, Lebanon, Salem, Springfield, Roseburg, Corvallis |

## CATEGORIES OF SOCIAL EFFECTS ("Variables")

The Work Group selected three categories of social effects as encompassing the significant social effects of the Forest Plan alternatives.

1. Job and Lifestyle Dependence

   Effects are changes in the whole pattern of work-subsistence-leisure which ties people to the Forest. Negative effects are created by actions which (1) reduce employment opportunities (jobs, pay, stability), (2) reduce the diversity of recreational opportunity, (3) reduce freedom of use of the Forest for subsistence (firewood, food) and recreation because of increased regulation and/or resource conflicts, or (4) lower the environmental qualities of the area. Actions which do the opposite are positive.

2. Community Cohesion

Effects are indicated by a change in the solidarity of a community, the degree of conflict, or division. Negative effects are seen in issues that divide the community. Significant negative effects occur when several divisive issues divide a community along the same lines, (polarizing issues). (However, controversy, if directed outward, can make a community more cohesive.)

3. Expectations of Minimal Change

Actions which are counter to the beliefs, perceptions, and sense of control that people have about the Forest are negative social effects; actions consistent with expectations are positive effects. People in the area have a preference for slow-to-moderate compatible growth (Obermiller, 1980). Negative effects occur from significant changes in (1) timber management practices, (2) the appearance of the Forest, (3) the public's freedom of use for recreation and firewood, (4) the supply of wood for industry, and (5) the development of mineral and energy sources. Actions which increase uncertainty have negative effects too.

## SOCIAL EFFECTS WITH FEW VARIATIONS BETWEEN ALTERNATIVES

1. Land Ownership and Use Changes

Land exchanges would be primarily with corporations which would use the land for Forest use (in accordance with the County land use zones). Land for development is generally off-Forest, and not significantly affected by decisions made in the Forest Plan. County land use zones will reduce the possibility of changing uses anyway.

2. Population and Crowding

The Alternatives will probably not cause changes in the economic and social conditions of the Area of Influence great enough to affect the population in a predictable way. Migration in recent years has been responsive to both employment and a variety of amenity and lifestyle factors. No net population effect from the Alternatives could be discerned.

3. Racial and Cultural Minorities

About 2 percent of the population of the Area of Influence east of the Cascades are members of racial or cultural minorities. Six percent of the Westside residents are members of racial minorities and 2 percent are hispanic. Apart from American Indians, they have no unique ties to the Deschutes National Forest. The Alternatives will, therefore, have no special social effects on them.

Most American Indians in and adjacent to the Area of Influence reside in Jefferson County (1,990 or 17 percent of the County's 1980 population). They reside on, or have strong ties to, the Confederated Tribes of the Warm Springs Indian Reservation. Most of their social, economic, and cultural ties to Forest land occur on the Reservation, though some unidentified private use of the Deschutes National Forest probably occurs. Data on Indian ties to the Deschutes National Forest was not sufficient to discern any clear social effects of the Alternatives.

4. Ranching Communities

The social effects on these groups, given the small grazing program on the Deschutes National Forest and their greater dependence on Bureau of Land Management, Crooked River National Grasslands, and Ochoco National Forest, were not of sufficient magnitude to demonstrate a clear pattern of social effects.

5. Hunting and Fishing

This is one factor with potentially significant social effects which would have very little variation between Alternatives. Thus, it will not show as a social effect of the Alternatives. The Alternatives provide varying levels of wildlife habitat and provide for the maintenance and improvement of fish habitat. No significant social effects could be directly linked to habitat. Changes in hunting and fishing regulations could result in social effects, but regulations governing hunting and fishing are under the authority of the Oregon Department of Fish and Wildlife, therefore, social effects relating to hunting and fishing were not evaluated.

SOCIAL EFFECTS WHICH WOULD VARY BY ALTERNATIVE

Table _____ shows the social effects which vary by alternative.

Table H-1 Current Direction (Alternative A)

| | Types of Jobs and Lifestyles | Community Cohesion | Expectations of Minimal Change |
|---|---|---|---|
| Area Wide | Increasing restrictions, regulations and instructions for use of resources (firewood, recreation permits, and fees). Increasing pressure and conflicts on resources. Wide diversity of recreational opportunities. | Resource conflicts now handled on a case-by-case basis, compromises and substitutions found. Foresee a decreasing ability to find substitute areas/resources to resolve thus intensifying conflicts. | Increasingly intensive timber management practices will change visual and recreational aspects of the Forest. Minimum maintenance of roads and recreation sites. Increased competition for resources--between resources and for same ones. |
| Central Oregon Urban Center | Adequate to good wood products industry. Trade and service center for Central Oregon plateaued, gradual growth later. Wood products increasingly capital intensive. Feelings of self-sufficiency increasingly difficult because of regulation and conflicts. Increasing scarcity of accessible firewood. | Room to compromise will diminish. Resource conflicts will be harder to resolve and tend to polarize the community more. Community cohesion will suffer, particularly if conflicts are managed poorly. | Harvest and burns in visible areas (especially lodgepole) will be disconcerting. Competition for recreational space/experience will reduce quality of experience. |
| Rural Recreation and Residential Communities | Lifestyle centered around environmental amenities and leisure (outdoor recreation). Timber management in adjacent and traveled areas will create concern. | Concerns center around environmental quality and amenities and recreation. Coming conflicts will tend to increase the internal cohesion of these communities. | Visible changes in Forest, increased use of fire, increased harvest in travel, and recreation areas will be troubling. Minimal maintenance of facilities troubling. |
| Rural Industrial Communities | Adequate to good wood products industry increasingly capital intensive. Feelings of self-sufficiency diminished through regulation and conflicts. | Have concerns about resource use and economy. Coming conflicts will tend to increase the internal cohesion of these aspects of these communities. | Minimal change, changes in harvesting and milling as lodgepole harvest is increased. Increasing competition for logs. |
| West Side Communities | Deschutes National Forest touches only a segment of lives as a recreational area; may be an increasingly significant source of raw material for industry. Regulation and conflicts will impinge on recreation and self-sufficiency activities. | Some segments already somewhat polarized. Deschutes National Forest conflicts seen as symbolic of the same issues elsewhere. | Any of the above, as they touch on the person's/group's principal orientation to the Deschutes National Forest. |

Alternative B

The social effects of Alternative B are similar to those of Alternative F, with one exception. Geothermal development near areas heavily used for recreation will be disruptive to many from all types of communities.

| Alternative C | Types of Jobs and Lifestyles | Community Cohesion | Expectations of Minimal Change |
|---|---|---|---|
| Area Wide | An increase in wood products industry jobs (cyclical) and some increase in recreation jobs (low-paying). It gives the most stimulus to the local economy of all Alternatives. Has the most potential development of geothermal resource, but extent not predictable; could cause major changes. A reduction in the diversity of recreation opportunities from Current Direction (Alt. A). More roads, ORV use, regulations, and controls. Personal-use firewood unavailable to meet demand, causing higher heating costs and loss of enjoyed activity. | The most polarizing of the Alternatives. Industrial aspects versus environmental quality aspects. Developed and motor based recreation versus nonmotorized recreation. Termination of permits for summer homes controversial. Debates on geothermal development and on allocation of firewood. | The intensity of management and the density of Forest use is far greater than under the Current Direction Alternative. Lower quality of recreation experience because of more encounters and conflicts with other uses and other recreationists. Significant change in recreation and appearance of Forest, even in visually and recreationally sensitive areas. |
| Central Oregon Urban Center | An increase in wood products industry jobs (cyclical) and some increase in recreation jobs (low-paying). It gives the most stimulus to the local economy of all Alternatives. Has the most potential development of geothermal resource, but extent not predictable; could cause major changes. A reduction in the diversity of recreation opportunities from Current Direction (Alt. A). More roads, ORV use, regulations and controls. Personal use firewood unavailable to meet demand, causing higher heating costs and loss of enjoyed activity. | Polarizing divisiveness between those with economic and environmental concerns; between motorized and nonmotorized recreationists; between rich and poor firewood users. | The intensity of management and the density of Forest use is far greater than under the Current Direction (Alt. A). Potential industrial (geothermal) development in sensitive areas. Lower quality of recreation experience because of more encounters. Significant change in recreation and appearnace of Forest. |
| Rural Recreation and Residential Communities | Loss of recreational diversity, particularly at the more primitive categories of the ROS spectrum. Some increase in recreation based jobs, primarily servicing developed recreation sites and activities. | Increased internal cohesiveness to protest timber management actions, road improvements, geothermal development in recreation areas, firewood policy. Termination of permits for summer homes issue may intensify the cohesion. Increased scrutiny of timber management plans and practices. | Everything changes much faster than under the Current Direction (Alt. A) (roads, timber sales, people, summer home). Change touches many aspects that are reasons for living and recreating here. |

| Alternative D | Types of Jobs and Lifestyles | Community Cohesion | Expectations of Minimal Change |
|---|---|---|---|
| Area Wide | Wood products and recreation jobs increase some. (This alternative second in economic stimulus to Alternative C.) Less nonmotorized recreational opportunity, but more motorized. Greater regulation and controls than Current Direction (Alt. A). Personal use firewood scarce. Potential geothermal development hard to predict, but no leasing in sensitive recreation areas could be a major economic impetus and social impact. | Some polarization centered on economic outputs. Conflict between motorized and nonmotorized recreation interests. Principal conflicts over improving roads, firewood, geothermal. | Significant changes but not noticeable to the casual visitor unless major geothermal development occurs. Possible increase in conflicts between recreation users. Improving and building roads will be seen as change. Firewood scarcity is disruptive. |
| Central Oregon Urban Center | Wood products and recreation jobs increase some. (This alternative second in economic stimulus to Alternative C). Less normotorized recreational opportunity, but more motorized. Greater regulation and controls than Current Direction. Personal use firewood scarce. Potential geothermal development hard to predict, but no leasing in sensitive recreation areas could be a major economic impetus and social impact. | Same as for Area Wide, with some conflicts between recreationists, and over firewood and geothermal. | Significant changes but not noticeable to the casual visitor unless major geothermal development occurs. Possible increase in conflicts between recreation users. Improving and building roads will be seen as change. Firewood scarcity disruptive. |
| Rural Recreation and Residential Communities | Less recreational diversity, and less nonmotorized. Some more recreation based jobs. Visual quality better. Personal use firewood scarce. Potential geothermal development hard to predict, but no leasing in sensitive recreation areas could be a major economic impetus and social impact. | Same as for Area Wide, but opposition to road improvements and building and to termination of summer homes may create some conflict-based rohesion. Geothermal development may be generally opposed. Competition for firewood increases, as does scrutiny of timber management. | Significant changes but not noticeable to the casual visitor unless major geothermal development occurs. Possible increase in conflict between recreation users. Improving and building roads will be seen as change. Firewood scarcity is disruptive. |
| Rural Industrial | Wood products jobs up some, motorized recreation increases some, and fewer restrictions and regulation make Forest easier to use for recreation and subsistance. Personal-use firewood scarce. Potential geothermal development hard to predict, but no leasing in sensitive recreation areas could be a major economic impetus and social impact. | Conflict over impacts of geothermal development. Cohesion grows in response to issues raised by others and over access to scarce personal use firewood. | Significant changes but not noticeable to the casual visitor unless major geothermal development occurs. Possible increase in conflict between recreation users. Improving and building roads will be seen as change. Firewood scarcity is disruptive. |

Alternative D (Continued)

| | Types of Jobs and Lifestyles | Community Cohesion | Expectations of Minimal Change |
|---|---|---|---|
| Jest Side Communities | About the same in its effects as the Current Direction (Alt. A). It does provide a little more of everything except undeveloped recreation opportunities are reduced. | Some polarization centered on economic outputs. Conflict between motorized and nonmotorized recreation interests. Principal conflicts over improving roads. | Significant changes but not noticeable to the casual visitor unless major geothermal development occurs. Possible increase in conflict between recreation users. Improving and building roads will be seen as change. Firewood scarcity is disruptive. |

## Alternative E

The social effects of Alternative E are similar to those of Alternative F, with one exception. The reactions to geothermal development, which may occur in more areas than under Alternative F, may be stronger and less conducive to community cohesion more contrary to expectations of minimal change.

## Alternative F

| | Types of Jobs and Lifestyles | Community Cohesion | Expectations of Minimal Change |
|---|---|---|---|
| Area Wide | Effects are quite close to those in Current Direction (Alt. A). Some added wood products jobs, some increase in diversity of recreation opportunity. Somewhat fewer conflicts because of changes in land allocations compared to Current Direction (Alt. A). Self-sufficiency improved some, with personal-use firewood available at current level. | Very close to Current Direction (Alt. A). Management may become more intensive, thus intensifying conflicts. Ease of resolution of on-the-ground conflicts and encounters is improved due to change in land allocations. | Very close to Current Direction (Alt. A). More outputs and more intensive management than Current Direction (Alt. A) but level of change would be acceptable. Geothermal development only in least sensitive areas, few major concerns. Firewood supply constant, so may be a problem if demand increases - more regulations and restrictions. |
| Central Oregon Urban Center | Effects are quite close to those in Current Direction (Alt. A). Some added wood products jobs, some increase in diversity of recreation opportunity. Somewhat fewer conflicts because of changes in land allocations compared to Current Direction (Alt. A). Self-sufficiency improved some, with personal use firewood available at current level. | Very close to Current Direction (Alt. A). Management may become more intensive, thus intensifying conflicts. Ease of resolution of on-the-ground conflicts and encounters is improved due to change in land allocations. | Very close to Current Direction (Alt. A). More outputs and more intensive management than Current Direction (Alt. A) but level of change would be acceptable. Geothermal development only in least sensitive areas, few major concerns. Firewood supply constant, so may be a problem if demand increases - more regulations and restrictions. |
| Rural Recreation and Residential Communities | Effects very close to those in the Current Direction (Alt. A). | Same as for Area Wide. Some conflict-based cohesion may be centered on visible timber management activities and visible geothermal development. | Very close to Current Direction (Alt. A). More outputs and more intensive management than Current Direction (Alt. A) but level of change would be acceptable. Geothermal development only in least sensitive areas, few major concerns. Firewood supply constant, so may be a problem if demand increases - more regulations and restrictions. |

Alternative F (Continued)

|  | Types of Jobs and Lifestyles | Community Cohesion | Expectations of Minimal Change |
|---|---|---|---|
| Rural Industrial Communities | Effects are quite close to those in Current Direction (Alt. A). Some added wood products jobs, some increase in diversity of recreation opportunity. Somewhat fewer conflicts because of changes in land allocations compared to Current Direction (Alt. A). Self-sufficiency improved some, with personal-use firewood available at current level. | Very close to Current Direction (Alt. A). Management may become more intensive, thus intensifying conflicts. Ease of resolution of on-the-ground conflicts and encounters is improved due to change in land allocations. | Very close to Current Direction (Alt. A). More outputs and more intensive management than Current Direction (Alt. A) but level of change would be acceptable. Geothermal development only in least sensitive areas, few major concerns. Firewood supply constant, so may be a problem if demand increases - more regulations and restrictions. |
| West Side Communities | Effects very close to those in the Current Direction (Alt. A). | Very close to Current Direction (Alt. A). Management may become more intensive, thus intensifying conflicts. Ease of resolution of on-the-ground conflicts and encounters is improved due to change in land allocations. | Very close to Current Direction (Alt. A). More outputs and more intensive management than Current Direction (Alt. A) but level of change would be acceptable. Geothermal development only in least sensitive areas, few major concerns. Firewood supply constant, so may be a problem if demand increases - more regulations and restrictions. |

| Alternative G | Types of Jobs and Lifestyles | Community Cohesion | Expectations of Minimal Change |
|---|---|---|---|
| Area Wide | Small increase in wood products jobs, geothermal development, and winter sports expansion and use. The economy is impacted negatively. Increase in primitive recreation. Demand for firewood will be met. | Conflict will occur over timber, geothermal, ski area expansion, summer homes, and winter sports access. Conflict would all tend to focus at Forest Service, so would, in effect, increase community cohesion. | The expectations of slow change are violated by a group of decisions which would block a number of changes which people expect. Would be seen as too little change, and harmful to the communities' stability. |
| Central Oregon Urban Center | Small increase in wood products jobs, geothermal development, and winter sports expansion and use. The economy is impacted negatively. Increase in primitive recreation. Demand for firewood will be met. | Conflict will occur over timber, geothermal, ski area expansion, summer homes, and winter sports access. Conflict would all tend to focus at Forest Service, so would, in effect, increase community cohesion. | The expectations of slow change are violated by a group of decisions which would block a number of changes which people expect. Would be seen as too little change, and harmful to the communities' stability. |
| Rural Recreation and Residential Communities | Fewer timber management activities and fewer visual disturbances. Impact on economy, winter sports, summer homes counter to way of life and recreation. | Conflict will occur over timber, geothermal, ski area expansion, summer homes, and winter sports access. Conflict would all tend to focus at Forest Service, so would, in effect, increase community cohesion. | The expectations of slow change are violated by a group of decisions which would block a number of changes which people expect. Would be seen as too little change, and harmful to the communities' stability. |
| Rural Industrial Communities | Small increase in wood products jobs, geothermal development, and winter sports expansion and use. The economy is impacted negatively. Increase in primitive recreation. Demand for firewood will be met. | Conflict will occur over timber, geothermal, ski area expansion, summer homes, and winter sports access. Conflict would all tend to focus at Forest Service, so would, in effect, increase community cohesion. | The expectations of slow change are violated by a group of decisions which would block a number of changes which people expect. Would be seen as too little change, and harmful to the communities' stability. |
| West Side | The Deschutes National Forest becomes more visible to groups on the West side. Loss of timber and lack of winter sports expansion become noticeable. | Concern over specific decisions adds to local conflicts. | Would be seen as violating expectations that things would go as they are going now. |

## Alternative H

The social effects of Alternative H will be similar to those of Alternative G, with this exception: If timber is harvested on an accelerated basis in a departure from NDEF, the economic impacts on wood products jobs will not be as extreme.

| Alternative H | Types of Jobs and Lifestyles | Community Cohesion | Expectations of Minimal Change |
|---|---|---|---|
| Area Wide | Small increase in wood products jobs. An increase in primitive recreational opportunities. Ease of use about the same as under Current Direction (Alt. A), except motorized use is restricted on some roads and areas. | Generally there are the same conflicts with this alternative as with Current Direction (Alt. A). However, concerns over departure, beetle program, road closures, and summer homes may tend to be more polarizing than Current Direction (Alt. A). | A little less change than under Current Direction (Alt. A) and thus a little less impact on this category. |
| Central Oregon Urban Center | Small increase in wood products jobs. An increase in the primitive category of recreational opportunities. Ease of use about the same as under the Current Direction (Alt. A), except motorized use is restricted on some roads and areas. | Generally there are the same conflicts with this alternative as with Current Direction (Alt. A). However, concerns over departure, beetle program, road closures, and summer homes may tend to be more polarizing than Current Direction (Alt. A). | A little less change than under Current Direction (Alt. A), and thus a little less impact on this category. |
| Rural Recreation and Residential Communities | About the same in its effects as the Current Direction (Alt. A). More evidence of timber management activities. | Probably a fairly agreeable alternative, but may be some conflict based cohesion based on conflicts over summer home termination and visible timber management activities. | Same as for Area Wide, plus changes associated with the termination of recreation residence permits. |
| Rural Industrial Communities | Increased timber output is supportive. Ease of use for subsistance and recreation is better than under the Current Direction (Alt. A) except for some roads. | Generally there are the same conflicts with this alternative as with Current Direction (Alt. A). However, concerns over departure, beetle program, road closures, and summer homes may tend to be more polarizing than Current Direction (Alt. A). | A little less change than under Current Direction (Alt. A), and thus a little less impact on this category. |
| West Side Communities | The Deschutes National Forest is not a visible topic for groups on the West side. This alternative has less impact on the West side than does Current Direction (Alt. A), but does provide more primitive category recreation opportunities. | Less conflict over the Deschutes National Forest than under Current Direction (Alt. A). | Less impact than the Current Direction (Alt. A) would have, except for changes on specific issues. |

# APPENDIX 1

# APPENDIX I
# SELECTION OF HARVEST CUTTING METHOD

## Harvest Cutting Methods

Harvest cutting methods include both even-aged and uneven-aged silvicultural systems. Even-aged harvest cutting methods (silvicultural treatment methods) generally include clearcutting, shelterwood cutting and seedtree cutting. Uneven-aged harvest cutting methods (silvicultural treatment methods) generally include individual tree selection and group selection cutting. The intent here is to document the rationale for selection of the broad harvest cutting methods (even-aged or uneven-aged) to be applied on the Forest. The specific harvest treatment methods (such as clearcutting, seedtree cutting or group selection), will be selected on a site specific basis as identified in environmental assessments or in silvicultural prescriptions written or approved by certified silviculturists.

## A Discussion of Even-aged vs Uneven-aged Selection Criteria

The criteria used for selection of harvest cutting methods were developed using selection criteria identified in the Regional Guide for the Pacific Northwest Region (1984) as well as direction provided in 36 CFR 219.27(b) for management prescriptions that involve manipulation of tree cover. A brief description of the criteria follows. A more detailed discussion of them can be found in the respective documents:

## Selection Criteria from the Regional Guide

1. The selected method must be permit the production of a volume of marketable trees sufficient to utilize all trees that meet utilization standards and are designated for harvest.

2. The selected method must permit use of a logging method which can remove designated trees without excessive damage to the residual stand and while meeting other established land management objectives. Table 3-1 in the Regional Guide displays the compatibility of logging systems with common harvest cutting methods. Generally, ground based logging methods, helicopters, and cable methods using slack pulling carriages are appropriate for all harvest methods while cable methods without slack pulling carriages and balloons are appropriate only for clearcuts.

3. The selected harvest method must be capable of providing special conditions that are required to meet resource management objectives. Table 3-2 in the Regional Guide displays commonly used harvest methods which achieve desired forest character. Generally, both even-aged and uneven-aged methods can meet desired forest character with the exception

of a mosaic of forest and opening and maximum wildlife species diversity. Here, uneven-aged methods are not applicable.

4. The selected method must permit control of vegetation to establish desired numbers and rates of growth of trees as well as other vegetation needed to achieve special management objectives. Tables 3-3 and 3-4 in the Regional Guide outline these harvest cutting methods. Generally, both even-aged and uneven-aged methods can be used in vegetation zones occurring on the Forest, however uneven-aged methods are not applicable for wildlife forage production or optimum tree seedling and sapling growth.

5. The selected method must promote a stand structure and species composition which minimizes serious risk from insects, disease, animal damage and wildfire and will allow treatment of existing insect, disease and fuel conditions. Table 3-5 in the Regional Guide displays harvest cutting methods favorable to the reduction and treatment of these agents. Generally, uneven-aged methods are not applicable where dwarf mistletoe and root disease present serious risks

6. The selected method must meet management objectives identified in the Regional Guide and Forest Plan.

## Selection Criteria from 36 CFR 219.27(b)

The seven criteria identified in 36 CFR 219.27(b) which direct management prescriptions for the manipulation of tree cover can be summarized as follows:

1. Be best suited to multiple use goals, considering biological, environmental, engineering, economics, and other impacts.

2. Assure that lands can be adequately restocked.

3. Not be chosen primarily because of the greatest dollar return or timber output, although these factors should be considered.

4. Consider the potential impacts on residual trees and adjacent stands.

5. Avoid permanent reduction of site productivity and ensure conservation of water and soil.

6. Provide the desired effects to meet special management objectives.

7. Be practical in terms of transportation and harvesting requirements and total costs of timber sale preparation, logging, and administration.

## Combined Criteria for Selection of Harvest Cutting Method

The criteria identified in the Regional Guide and in 36 CFR 219.27(b) were subsequently combined to eliminate duplication of intent and simplify the rationale for selecting the harvest cutting methods used to implement the Forest Plan. These seven combined criteria are summarized as follows:

1. Selected method must produce a volume of marketable trees that meet utilization standards and are designated for harvest. (Regional Guide: criteria 1)

2. Selected method must use available and acceptable logging methods. (Regional Guide: criteria 2, 36 CFR: criteria, 4)

3. Selected method must be capable of meeting special management objectives. (Regional Guide: criteria 3 and 6, 36 CFR: criteria 1 and 6)

4. Selected method must permit control of vegetation to establish desired species composition, density, and rates of growth (Regional Guide: criteria 4, 36 CFR: criteria 4 and 6)

5. Selected method must promote a stand structure and species compostion which minimizes risks from insects, disease and wildfire. (Regional Guide: criteria 5)

6. Selected method must assure that lands can be adequately restocked (36 CFR: criteria 2)

7. Selected method must be practical and economical in terms of transportation, harvesting, preparation and administration of timber sales. (36 CFR: criteria 7)

In addition, no harvest cutting method was selected solely because it resulted in the greatest dollar return or provided the highest output of timber, or which permanently reduced site productivity, or could not assure conservation of the water and soil resources. (36 CFR: criteria 3 and 5)

## Working Groups and Management Areas

Both even-aged and uneven-aged harvest cutting methods were available and evaluated for selection within the Forest's species working groups and management area combinations. The four working groups and their applicable management emphasis area combinations are summarized as follows:

| Working Group | Management Emphasis |
|---|---|
| Ponderosa pine | General Forest |
| | Bald Eagle |
| | Deer Habitat |
| | Scenic Views and Intensive Recreation |
| Lodgepole pine | General Forest |
| | Scenic Views |
| Mixed Conifer | General Forest |
| | Spotted Owl |
| | Scenic Views and Intensive Recreation |
| Mountain hemlock | General Forest |
| | Scenic Views |

## Literature Cited or Reviewed

The evaluation of harvest cutting methods is based on operational experience and research findings published in the following documents:

Barrett, J.W. 1979. Silviculture of ponderosa pine in the Pacific Northwest: the state of our knowledge. USDA For. Serv. Gen. Tech. Rpt. PNW-92, PNW For. and Range Exp. Stn., Portland, Or. 106 p.

Burns, R.M., tech. comp. 1983. Silvicultural systems for the major forest types of the United States. Ag. Handb. 445, USDA, Washington, D.C. 191 p.

Fowells, H.A., tech. comp. 1965. Silvics of forest trees of the United States. Ag. Handb. 271, USDA, Washington, D.C. 762 p.

Minore, D. 1979. Comparative autecological characteristics of northwestern tree species: a literature review. USDA For. Serv. Gen. Tech. Rpt. PNW-87, PNW For. and Range Exp. Stn., Portland, Or. 72 p.

Schmidt, W.C. and R.R. Alexander. 1985. Strategies for managing lodgepole pine. p. 201-210. In: Baumgartner, D.M., ed. Proceedings, Lodgepole pine: the species and its management. Coop. Extension, Wash. State Univ., Pullman, Wa.

Smith, D. 1962. The practice of silviculture. John Wiley & Sons, Inc. New York. 578 p.

## Rationale for Selection of Harvest Cutting Method

The following analysis documents the rationale for selection of harvest cutting method within each working group/ management emphasis area based on those combined criteria which have a significant effect on the selection:

### Ponderosa Pine Working Group

1. Ponderosa Pine/General Forest

Lands within this management area will be managed for both timber and forage production. Thermal and/or hiding coverfor big game will be provided on at least 25 percent of the area. Satisfactory tree growth rates should be maintained and stands should be protected from insects, disease and damage. Both even-aged and uneven-aged methods are biologically acceptable (Barrett, 1979; Burns, 1983). Even-aged methods generally provide enhanced forage production and maximize wildlife species diversity (combined criteria 3). Even-aged methods generally provide for enhanced seedling and sapling growth rates because of the significant effect of mature or larger trees on height and diameter growth of the understory (Barrett, 1979) (combined criteria 4). For this reason, uneven-aged methods generally produce reduced timber volumes. Clearcutting allows the introduction of genetically improved stock. Where dwarf mistletoe and root disease are present, uneven-aged methods are not applicable (combined criteria 5). Even-aged methods are more economical and practical in terms of transportation, harvesting, preparation and administration (Barrett, 1979; Burns, 1983) (combined criteria 7). Within this working group, periodic use of prescribed fire reduces fuel accumulations and eliminates undesirable competitive vegetation (Burns, 1983). Even-aged methods are more compatible with this treatment. Although uneven-aged methods are biologically acceptable, they generally produce reduced big game forage, reduced timber yields, increased risk of disease and wildfire, and a considerable increase in management costs and complexity. For these reasons, even-aged harvest cutting methods are selected for ponderosa pine/ general forest.

2. Ponderosa Pine/Bald Eagle

Habitat management for bald eagles will emphasize large, overmature trees potentially useable as perch trees and nest sites. Suitable trees should be available throughout time and should be widely distributed. A density of eight large trees per acre is satisfactory. Both even-aged and uneven-aged methods are biologically accepatble and can produce the small groups of large trees over time. The selected harvest cutting method must be capable of providing the special conditions which are required to meet the resource management objectives (combined criteria 3), and they take precedence over economic considerations and timber volume production. The selected should be capable of developing large diameter ponderosa pine or Douglas-fir perch and nest trees at the appropriate point in the rotation (combined criteria 3 and 4). Either even-aged or uneven-aged methods can be selected here. The ultimate selection should be based on specific site and stand characteristics and documented in an environmental assessment or silvicultural prescription.

### 3. Ponderosa pine/ Deer Habitat

Vegetation here will be managed to provide optimum habitat for deer. Special conditions required to meet the resource management objectives include providing hiding and/or thermal cover over 40 percent of the area as well as a vigorous forage base. Prescribed burning is recommended for site preparation and forage enhancement. Although both even-aged and uneven-aged harvest cutting methods are biologically acceptable, even-aged methods can best provide for the special conditions within this management area (combined criteria 3). Uneven-aged methods are generally not applicable where the desired character is a mosaic of forest and openings. In addition, the transportation system and entry frequency necessary for management of uneven-aged stands present an undesirable opportunity for deer harassment.

### 4. Ponderosa pine/ Scenic Views and Intensive Recreation

Ponderosa pine managed in this area will maintain visual diversity through variations of stand densities and size classes. Large, old growth trees will provide an important stand component. Both even-aged and uneven-aged methods are biologically appropriate and can provide for the visual variety and maintenance of a large tree component. Here, the special conditions required to meet management objectives take precedence over economic considerations or timber volume production (combined criteria 3). Tree growth rates should be sufficient to produce the characteristic large tree component within the rotation age and maintain trees in a healthy condition (combined criteria 4). In addition, trees should be managed to minimize risks from insects, disease and wildfire (combined criteria 5). Either even-aged or uneven-aged harvest cutting methods may be selected here. The ultimate selection should be based on specific site and stand characteristics and documented in an environmental assessment of silvicultural prescription.

## Lodgepole Pine Working Group

### 1. Lodgepole pine/ General Forest

Lands within this management area should be managed for both timber and forage production. Thermal and/or hiding cover for big game will be provided on at least 25 percent of the area. Satisfactory growth rates should be maintained and stands protected from insects, disease and wildfire. While some variation does occur, the lodgepole pine type is generally considered to be a pure, even-aged, single-storied, overly dense forest (Burns, 1983). This stand structure and condition has provided the setting for a catastrophic mountain pine beetle epidemic. The mature infested and susceptible stands will be converted to less susceptible, young stands within a 15 to 20 year period. Although both even-aged and uneven-aged harvest cutting methods are biologically acceptable, the current stand structure and catastrophic conditions strongly favor even-aged methods. With an annual harvest program in lodgepole pine which approaches 15,000 acres, strong consideration must be given to methods which are practical and economical in terms of transportation, harvesting, and timber sale preparation and administration (combined criteria 7). This is particularly significant in view of current relatively low stumpage values for lodgepole pine. Opportunities for forage production are generally more favorable using even-aged methods (combined criteria 3). Desired tree growth rates and resistance to future mountain pine beetle epidemics can generally be maintained with greater success using even-aged methods (Schmidt and Alexander, 1985) (combined criteria 4). Serious dwarf mistletoe problems are common in lodgepole pine. Uneven-aged methods will perpetuate this problem and are not applicable in this situation (Schmidt and Alexander, 1985) (combined criteria 5). For these reasons, even-aged methods are recommended for lodgepole pine in the general forest management area.

### 2. Lodgepole Pine/Scenic Views

Lodgepole pine will be managed in this area to increase species and size class diversity and maintain stands in a healthy condition. Here, the stand structure and condition, as well as operational constraints common to the general forest management area will apply. Although both even-aged and uneven-aged methods are biologically acceptable, the even-aged method is strongly favored. Management here will differ from the general forest primarily in scale. Emphasis will be placed on retention of islands of healthy, immature lodgepole pine and native ground vegetation. Even-aged methods are selected here to meet these special management objectives (combined criteria 4).

## Mixed Conifer Working Group

### 1. Mixed conifer/ General Forest

Lands within this management area will be managed for both timber and forage production. Thermal and/or hiding cover for big game will be provided on at least 25 percent of the area. Satisfactory growth rates should be maintained and stands should be protected from insects, disease and damage. Species composition in this working group should be controlled to produce trees which can maintain these satisfactory growth rates and resistance to insects, disease and damage. Both even-aged and uneven-aged methods are biologically acceptable here. The selection decision is weighted heavily by successional trends and upon the relative shade tolerance of species present within the mixed conifer working group (Burns, 1983; Minore, 1979). Here, shade intolerant species including ponderosa pine, Douglas-fir, western white pine, western larch, and noble fir are considered more desirable and better meet management objectives for growth and resistance to insects, disease and damage. Even-aged management is most desirable to convert overmature, old-growth stands to vigorous stands of shade intolerant species (Burns, 1983) (combined criteria 4 and 5). Also, on the Deschutes National Forest, mixed conifer stands frequently occur on slopes greater than 30 percent where acceptable logging systems and fuels treatment favor even-aged methods (combined criteria 2). These methods are generally more practical and economical in terms of transportation, harvesting, preparation and administration of timber sales (combined criteria 7). Even-aged methods are selected for the mixed conifer/general forest.

### 2. Mixed Conifer/Spotted Owl

Habitat for spotted owls should be characterized by mature and overmature stands of trees with a relatively dense understory. Management for spotted owls will be directed to developing a two or three-storied stand which contains eight to ten old-growth trees per acre. Suitable habitat should be available at all times. This stand structure is required to provide nesting and rearing habitat for owls as well as habitat for desirable prey species. Both even-aged and uneven-aged methods are biologically acceptable and can produce the desired stand structure. The selected harvest cutting method must be capable of providing the special conditions which are required to meet the resource management objectives (combined criteria 3), and they take precedence over economic considerations and timber volume production. The selected method should be capable of developing a stand of trees with the appropriate structure, size, and species composition during the rotation (combined criteria 3 and 4). Either even-aged or uneven-aged methods can be selected here. The ultimate decision should be based on specific site and stand characteristics and documented in an environmental assessment or silvicultural prescription.

3. Mixed Conifer/Scenic Views and Intensive Recreation

Mixed conifer stands managed in this area will provide a variety of species, snags and size classes. Large, old-growth trees will provide an important stand component. Both even-aged and uneven-aged harvest cutting methods are biologically applicable and can provide for the visual variety and maintenance of the large tree component. Here, the special conditions required to meet visual management objectives are the primary consideration (combined criteria 3). While economic returns and timber volume production are also important, they play a secondary role in this management area. Tree growth rates should be sufficient to produce the characteristic large tree component within the rotation age and maintain trees in a healthy condition (combined criteria 4). In addition, trees should be managed to minimize risks from insects, disease and wildfire (combined criteria 5). Either even-aged or uneven-aged methods may be selected here. Uneven-aged methods may require artificial regeneration to maintain the appropriate species composition and may be restricted to sites where acceptable logging methods can be applied (combined criteria 2). Uneven-aged methods are not applicable where insect or disease conditions cannot maintain stands relatively free of risk (combined criteria 5). The ultimate selection should be based on specific stand and site characteristics and documented in an environmental assessment or silvicultural prescription.

## Mountain Hemlock Working Group

1. Mountain Hemlock/General Forest and Scenic Views

The mountain hemlock working group will be managed extensively to provide both timber and forage production. Thermal and/or hiding cover will be provided on at least 25 percent of the area. Satisfactory tree growth rates should be maintained and stands should be protected from insects, disease and damage. Both even-aged and uneven-aged methods are biologically acceptable (Burns, 1983). The selection decision is weighted heavily by successional trends and upon the relative shade tolerance of species present within the mountain hemlock working group (Burns, 1983; Minore, 1979). Here, shade intolerant species including lodgepole pine, shasta red fir and western white pine are considered more desirable because they better meet the management objectives with regards to growth and resistance to insects, disease and damage. Even-aged methods are most desirable to convert overmature, old-growth stands to vigorous stands of shade intolerant species (combined criteria 3 and 4). In view of the current relatively low stumpage values for mature and overmature mountain hemlock and associated true fir species and the unroaded condition of the majority of sites in this working group, strong consideration must be given to methods which are practical and economical in terms of transportation, harvesting, and timber sale preparation and administration (combined criteria 7). Steep and severe sites associated with the mountain hemlock working group will require harvest cutting methods where acceptable logging systems can be applied (combined criteria 2) and will permit control of vegetation to assure desirable stocking (combined criteria 6), species composition, and growth rates (combined criteria 4). Consideration must also be given to minimizing risks from insects and disease (combined criteria 5). Management objectives in the scenic views management area will differ from the general forest primarily in scale. Emphasis will be placed on retention of islands of healthy, immature trees of an acceptable species and native ground vegetation. Harvest cutting methods are largely untested in the working group. Even-aged methods are selected for the majority of sites. Uneven-aged systems may be applicable in a limited number of cases, particularly on very severe sites (Burns, 1983). The ultimate selection should be based on stand and site characteristics and documented in an environmental assessment or silvicultural prescription.

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